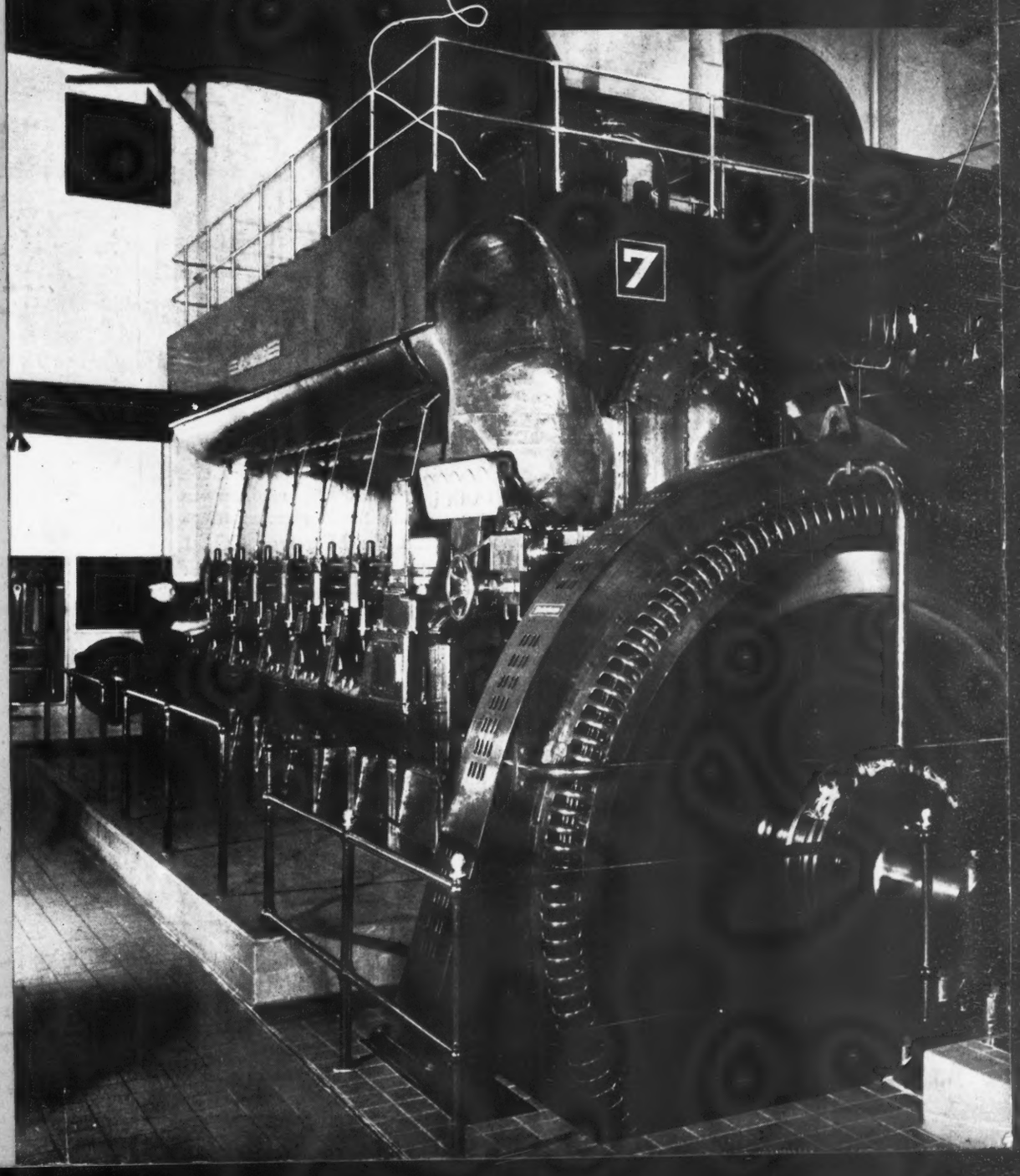
LOGY DEPT.

POWER

POWER GENERATION, TRANSMISSION, APPLICATION AND THE ATTENDANT SERVICES IN ALL INDUSTRIES



OVEMBER, 1942

r refrigeration loads mean your chines must produce more old". Practical pointers show w to get the most from exist- equipment and keep it on line. Page 86

tinuous running won't hurt tur- es under high-load condi- ns. Five rules for safe opera- n. Starts page 71

tric drives speed ships over sea es of the world. Wanted: li- sed engineers. See page 82

eamlined signals supervise gest office-building air-con- oning system at Metropolitan . Story begins on page 92

cks pile 20,000 tons of coal for ergency storage at eastern ustrial plant. Details of meth- described on page 68

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ble of Contents — Page 59

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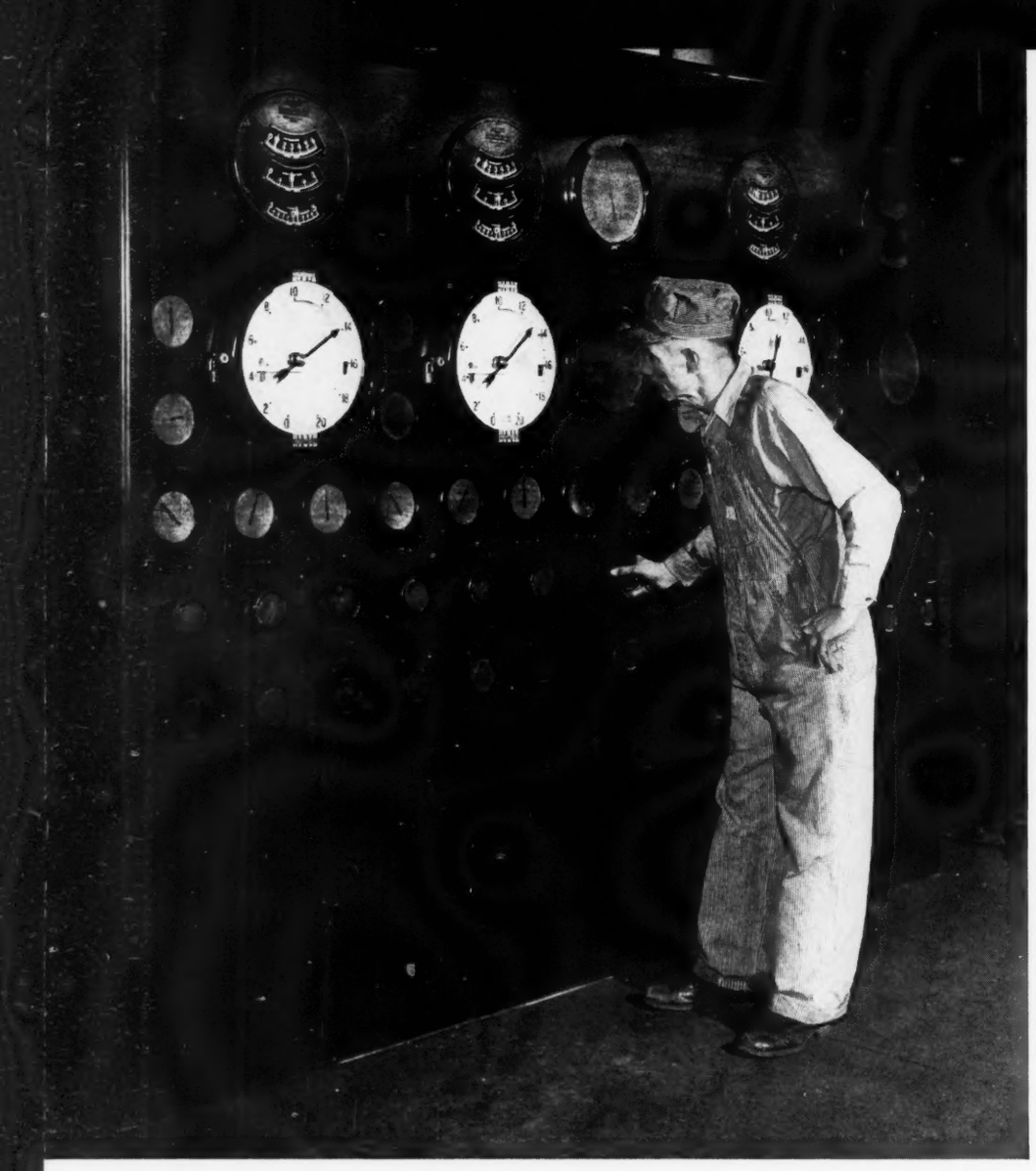
w 3000-hp diesel brings Rock- Centre municipal plant capac- to 12,500 hp. *(See page 64)*



HOW SCIOTO MEN Found the Answer to a CO_2 Recording Problem

Here's a success story from Scioto Station of Marion Reserve Power Co., Marion, Ohio:

For years, executives and boiler operators alike had wanted automatic records of CO_2; and for years they had been disappointed. They tried every device that came their way, but success was not for them; after each trial, back they went to their hand Orsats. Apparently, if an automatic CO_2 instrument was sensitive it was also easily corroded; if it was durable it had an unbearable time-lag; if it was good in every other way, it required half a man's time to keep it serviced. In station after station, everywhere they'd worked, engineers and operators had had the same experiences.

So, when the Micromax CO_2 Recorder came along, those gentlemen did no rushing in to try it. But they did read about it, and listen to descriptions. Such facts as "revolutionary change in principle; no drying line; no dessicators because gas is saturated; no cell corrosion; as fast as a Micromax pyrometer" caught their attention. And, because they wanted sincerely to succeed in improving their operation in ways which a good CO_2 Recorder could help, they finally installed just one round-chart Micromax CO_2 Recorder.

After months of Orsat checks; after operating first with the Recorder and then without; after watching it in every conceivable way, they found themselves using CO_2 readings as freely and as confidently as they used their draft gauges, pressure gauges, flowmeters and pyrometers. They had licked the CO_2 bogey. The fact that their station happens to require (and now has) three CO_2 Recorders, verifies their success.

If any reader has a CO_2-recording problem, we'll be glad to hear of it, and to send Catalog N-91-163, which describes Micromax CO_2 Recorders.

Admiral Henry A. Wiley, with Factory Manager W. R. Coley of L&N, pauses for a word with an L&N girl employee at time of Army-Navy "E" Award to L&N.

"E" for L&N

The Army-Navy E was awarded to the Leeds & Northrup Co. on September 5, in ceremonies featured by the presentation of the "E" Burgee to the organization as a whole, and the authorization of "E" Pins to its members.

Admiral Henry A. Wiley praised the Company's attitude, and the results it has produced. President C. S. Redding of L&N, joined by spokesmen for L&N employee groups, pledged continued increases in production. The Company's output consists of classified materiel, in addition to its established lines of instruments, telemeters, automatic controls and heat-treating furnaces.

William L. Batt, Vice-Chairman of W.P.B., voiced the Board's pleasure at having the achievements of Industry so recognized by our armed forces.

Jrl Ad N-91-163(11)

LEEDS & NORTHRUP COMPANY, 4910 STENTON AVE., PHILA., PA.

LEEDS & NORTHRUP

MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES

POWER (with which are consolidated "Science and Industry," "The Engineer Review," "The Engineer," and "The Stationary Engineer"), November, 1942, Vol. 86, No. 11. Published monthly with an additional Directory number in December. McGraw-Hill Publishing Company, Inc. Publication office, 99-129 North Broadway, Albany, N. Y. EDITORIAL AND EXECUTIVE OFFICES, 330 WEST 42ND STREET, NEW YORK, N. Y. Entered as second class matter August 25, 1936, at Post Office, at Albany, N. Y., under the act of March 3, 1879. Printed in U. S. A. Allow at least ten days for change of address. All communications about subscriptions should be addressed to the Director of Circulation, Power, 330 West 42nd Street, New York, N. Y. Subscription rates—U. S. and U. S. Possessions, $3.00 for one year, $4.00 for two years. Canada, $3.50 for one year, $5.00 for two years. Great Britain and British Possessions 36 shillings per year. All other countries $6.00 for one year, $9.00 for two years, 35c per copy.

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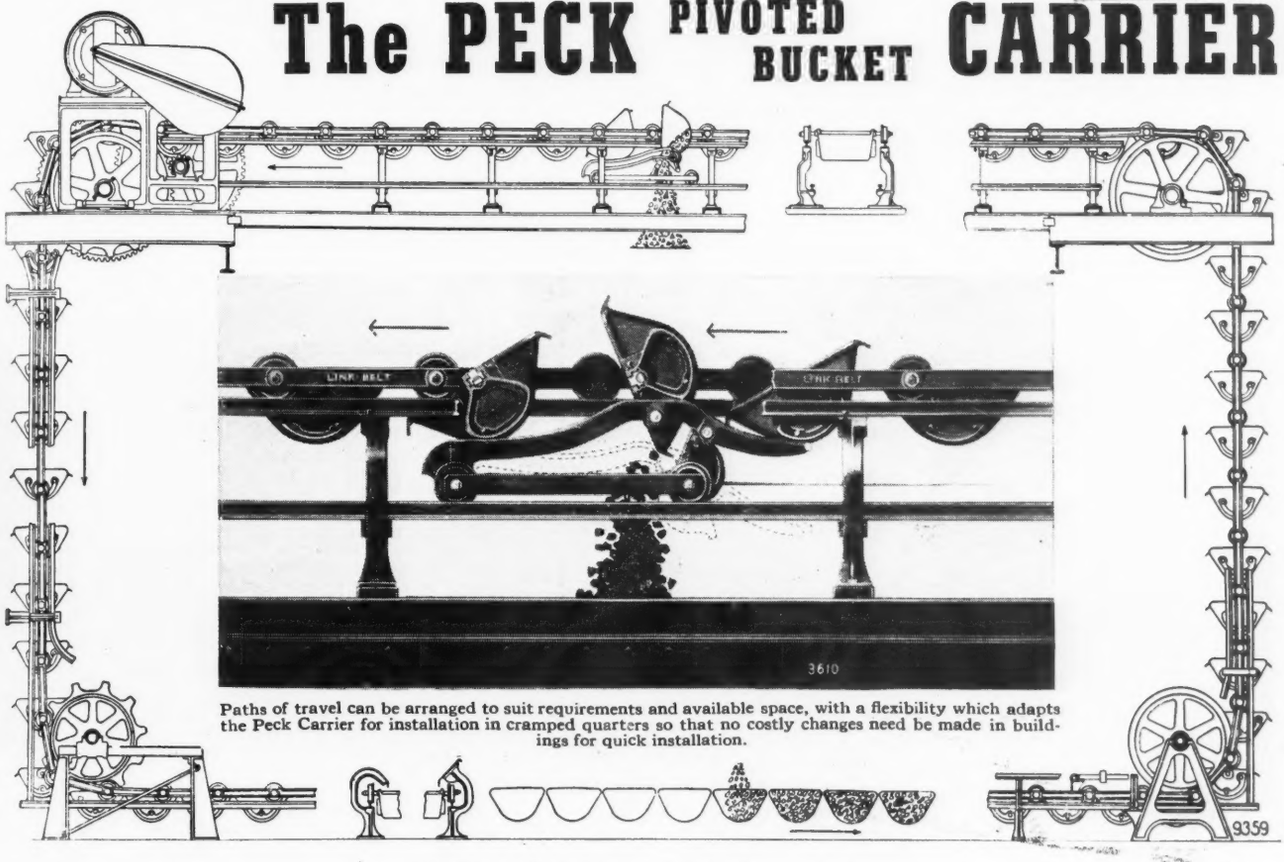
The PECK PIVOTED BUCKET CARRIER



Paths of travel can be arranged to suit requirements and available space, with a flexibility which adapts the Peck Carrier for installation in cramped quarters so that no costly changes need be made in buildings for quick installation.

- Conserves Steel and Other Critical Materials
- Standarized Design
- Saves Power
- Saves Space

Today, with low cost production of power essential in our victory effort, we suggest you look into the advantages of the Peck Carrier. It offers a dependable handling method extremely low in upkeep and one that conserves critical materials. Practically no rolled steel and no rubber are used in its construction. It performs four functions—(a) elevates the coal (b) carries coal horizontally for distribution to bunkers (c) carries ashes horizontally away from ash pile (d) elevates ashes for disposition. It elevates and conveys in a continuous flow, without transfer points, vertically, horizontally, on an incline over any path of travel in a single vertical plane. Operation is quiet and, as it moves slowly, there is practically no vibration. Send for Book No. 1720.

- Low Upkeep
- Resists Corrosion
- High Capacity
- Handles Materials at High Temperatures

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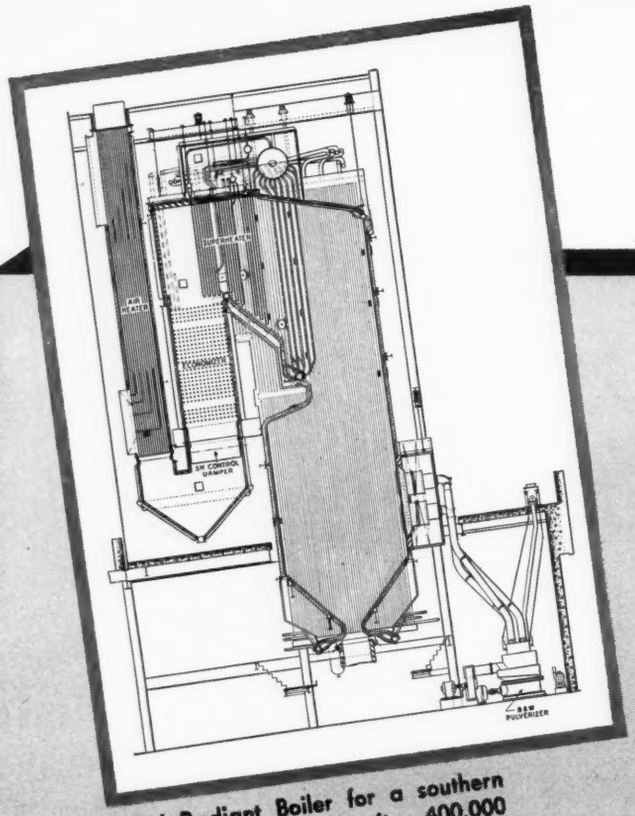
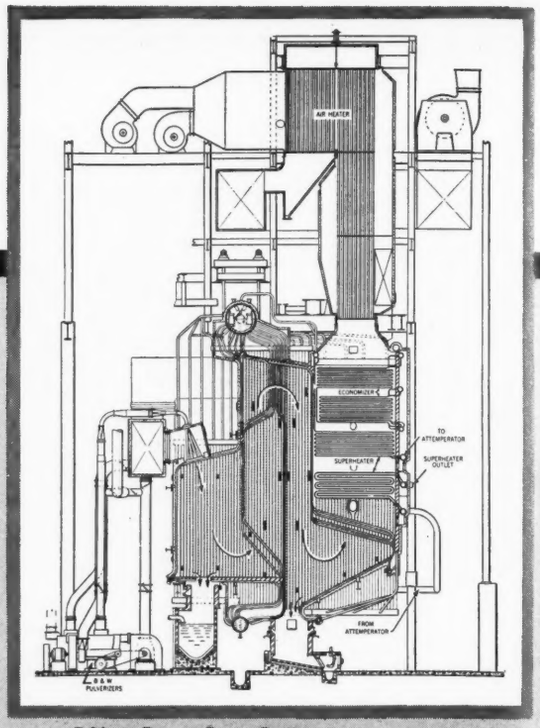
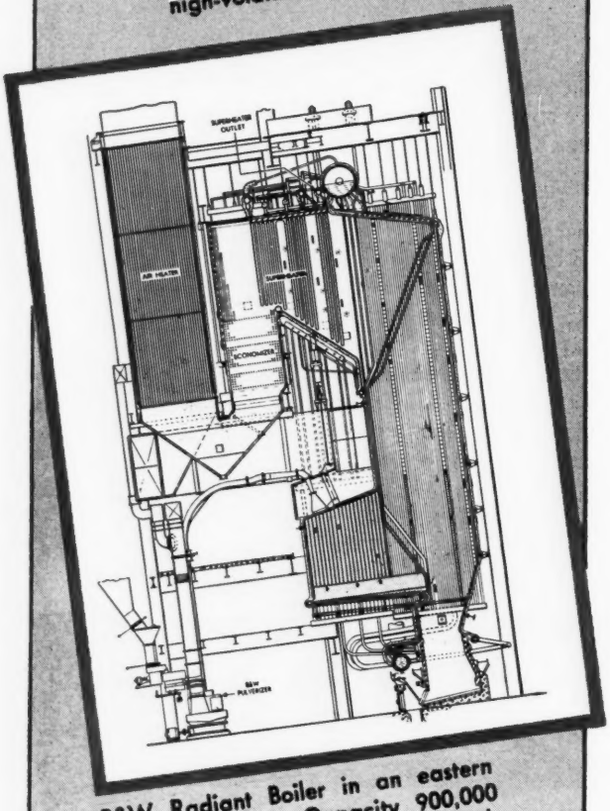


B&W Radiant Boiler for a southern central station — Capacity 400,000 lb. steam per hr. — Direct fired with high-volatile southern bituminous coal.



B&W Open-Pass Boiler in an eastern central station — Capacity 350,000 lb. steam per hr. — Direct fired with high-volatile eastern bituminous coal.

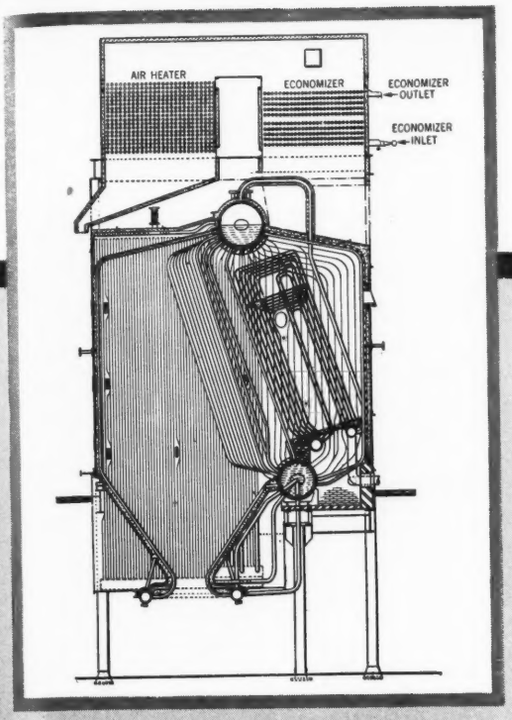


B&W Radiant Boiler in an eastern central station — Capacity 900,000 lb. steam per hr. — Direct fired with high-volatile eastern bituminous coal.

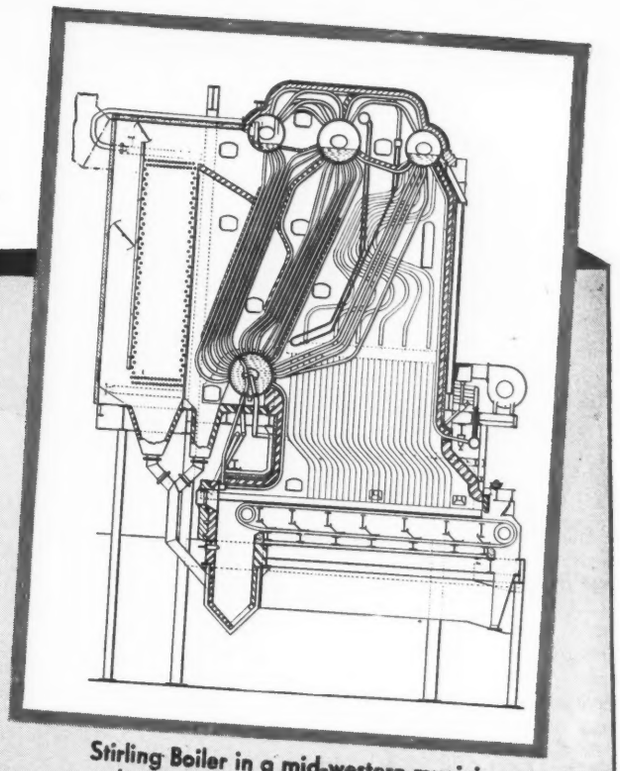
COAL MEETS THE *Pulverized and*

Steam plants today must be operated in the interest of the war effort, releasing from use the fuels needed by combat units. This has placed on coal the burden of carrying today's production load. With coal, as with other fuels, it is vital that it be burned economically and with minimum interruption to service. In the field of coal burning, B&W can be of great service to coal users, because of its invaluable knowledge and experience in the combustion of this and other fuels and through the coal-burning equipment it has made available.

The B&W Direct-Firing System is the result of the Company's lengthy experience with pulverized-coal firing, an experience that dates back to the earliest applications to power boilers. This system is fully coordinated, from bin to burners; the ball-bearing type pulverizer and rotating-table feeder being



B&W Integral-Furnace Boiler for an eastern central station — Capacity 150,000 lb. steam per hr. — Direct fired with high-volatile Kentucky bituminous coal.



Stirling Boiler in a mid-western municipal electric light plant — Capacity 125,000 lb. steam per hr. — Fired with high-volatile Indiana bituminous coal on a B&W Chain-Grate Stoker.

FUEL EMERGENCY-
Stoker Firing

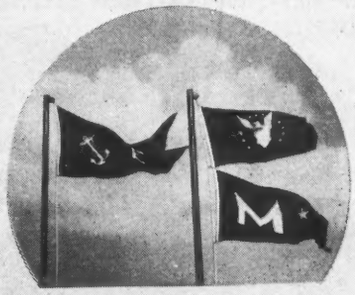
especially applicable to direct firing and to complete automatic control.

B&W Chain-Grate Stokers are widely used where economic considerations, size of boiler, and character of coal available make stoker firing advisable. These stokers burn a wide range of coals efficiently, are self-cleaning and low in maintenance.

B&W Water-Cooled Furnace Constructions have the diversity necessary for satisfying all the requirements of any method of firing, from supplying structural shape and strength, to promoting combustion and ash elimination in individual furnaces.

Complete B&W Boiler Units, such as those shown on these pages incorporating either method of firing and typical B&W Furnace Constructions, provide the means of meeting present-day fuel problems.

G-235T



The Maritime Victory flag and "M" burgee now float proudly alongside the Navy "E" at the Barberton Works. Each is an award for "outstanding achievement" and is "an honor not lightly bestowed".

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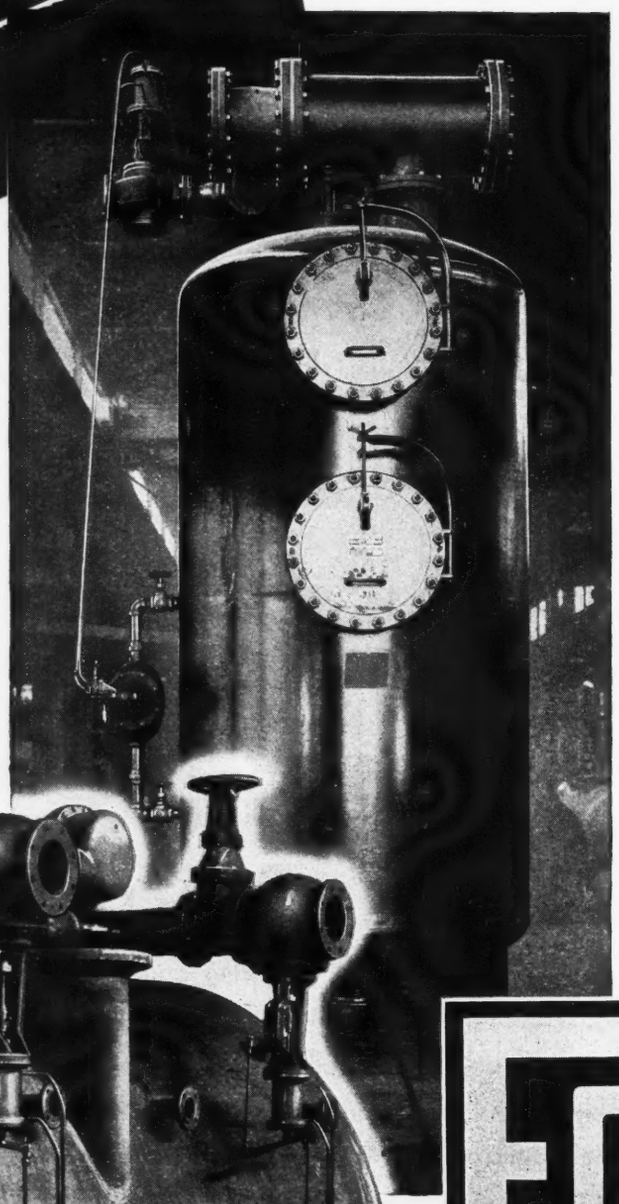
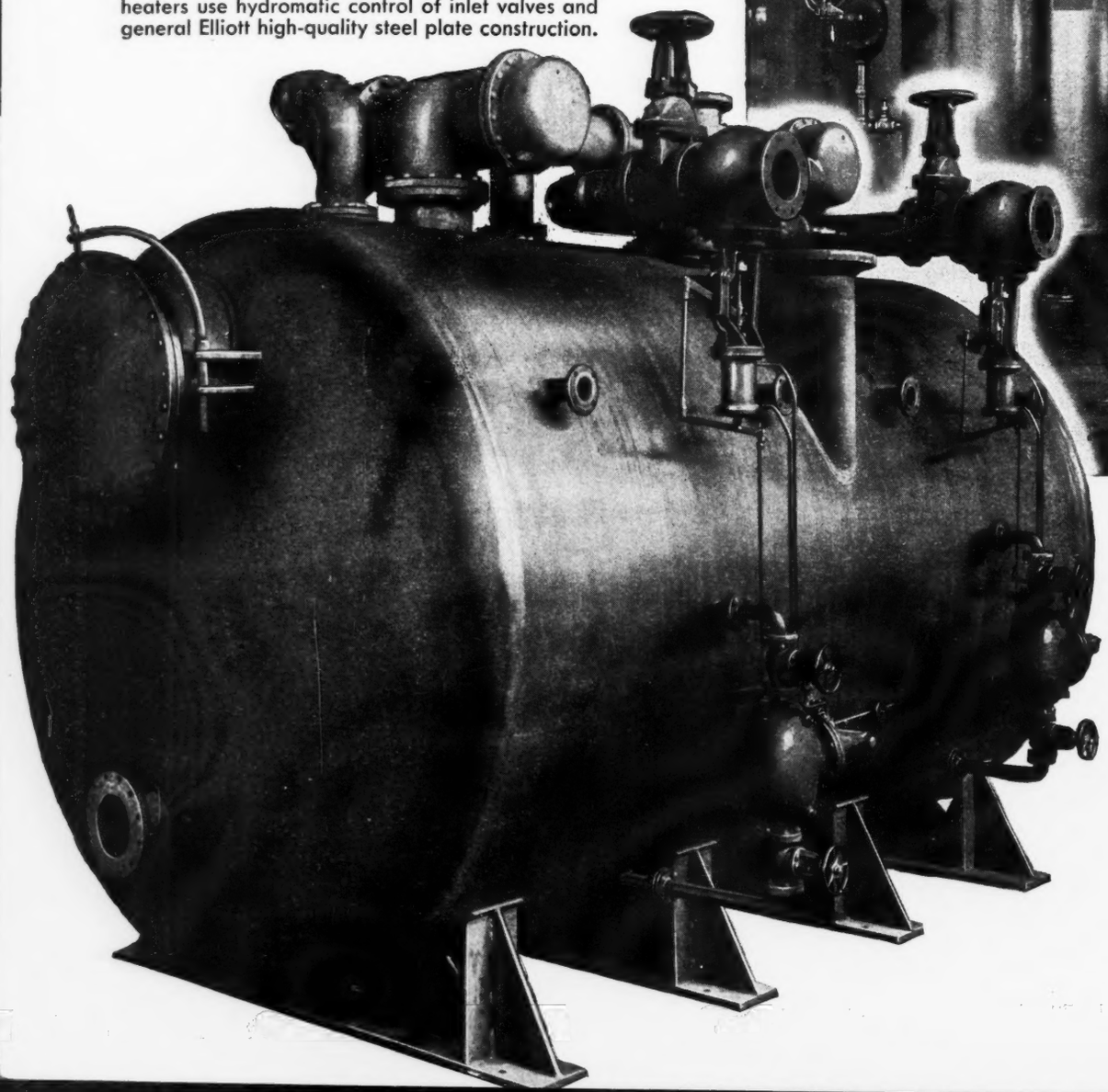
Enough man-days were lost through accidents last year to have produced 300,000 light tanks. To help minimize such losses, this Company has subscribed to the National Safety Council's War Production Fund to Conserve Man Power.

BLUEPRINT



The Elliot[illegible]er at the right is one of se[illegible] various plants of a maker of vit[illegible]rial. This unit has a capacity of 250,000 lb. per hr., and is one of several operating at a pressure of 125 lb., gage. Most of the plants of this company use deaerators operating at normal pressures, just above atmosphere. Power-operated, rather than direct-operated, regulating valves are used on the high-pressure deaerators.

Below — Elliott 600,000-lb.-per-hr. horizontal deaerating feedwater heater, typical of a group of 15 or 20 which have been furnished to some eight or nine defense power plants which have been constructed by one very well-known corporation. The heaters use hydromatic control of inlet valves and general Elliott high-quality steel plate construction.



for VICTORY

STANDARDIZED DEAERATING HEATER CONSTRUCTION SPEEDS DEFENSE PLANTS

Speed is the need of today. Scores of new power plants are going up, to serve various new ordnance and strategic material plants. In many of these power plants engineers have wisely adopted standardized construction as far as possible, saving much engineering and design work, and best of all, saving invaluable *time*.

Elliott deaerating feedwater heaters, fitting perfectly into this picture, have been furnished for many of these vital plants. Not only do these units heat feedwater to the saturated temperature of the steam supplied, but they also remove dissolved oxygen from the water, preventing corrosion troubles in piping, economizers and boilers.

In line with the savings produced by standardization and simplification, Elliott engineers can often make suggestions in any feedwater heating layout to save materials, extra piping, and perhaps suggest a more effective hook-up. Let's talk it over.

ELLIOTT COMPANY

Deaerator and Heater Dept., **JEANNETTE, PA.**

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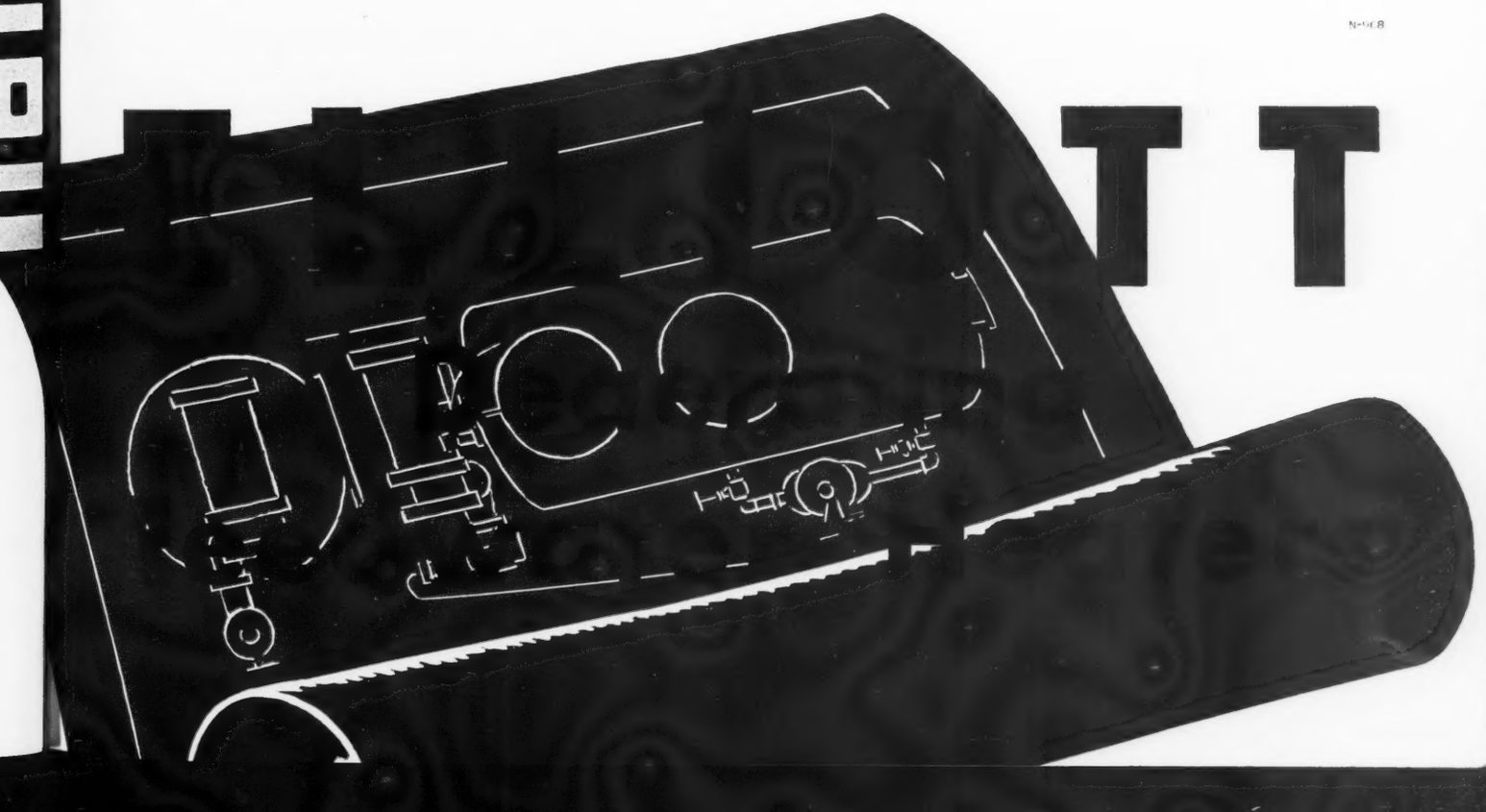
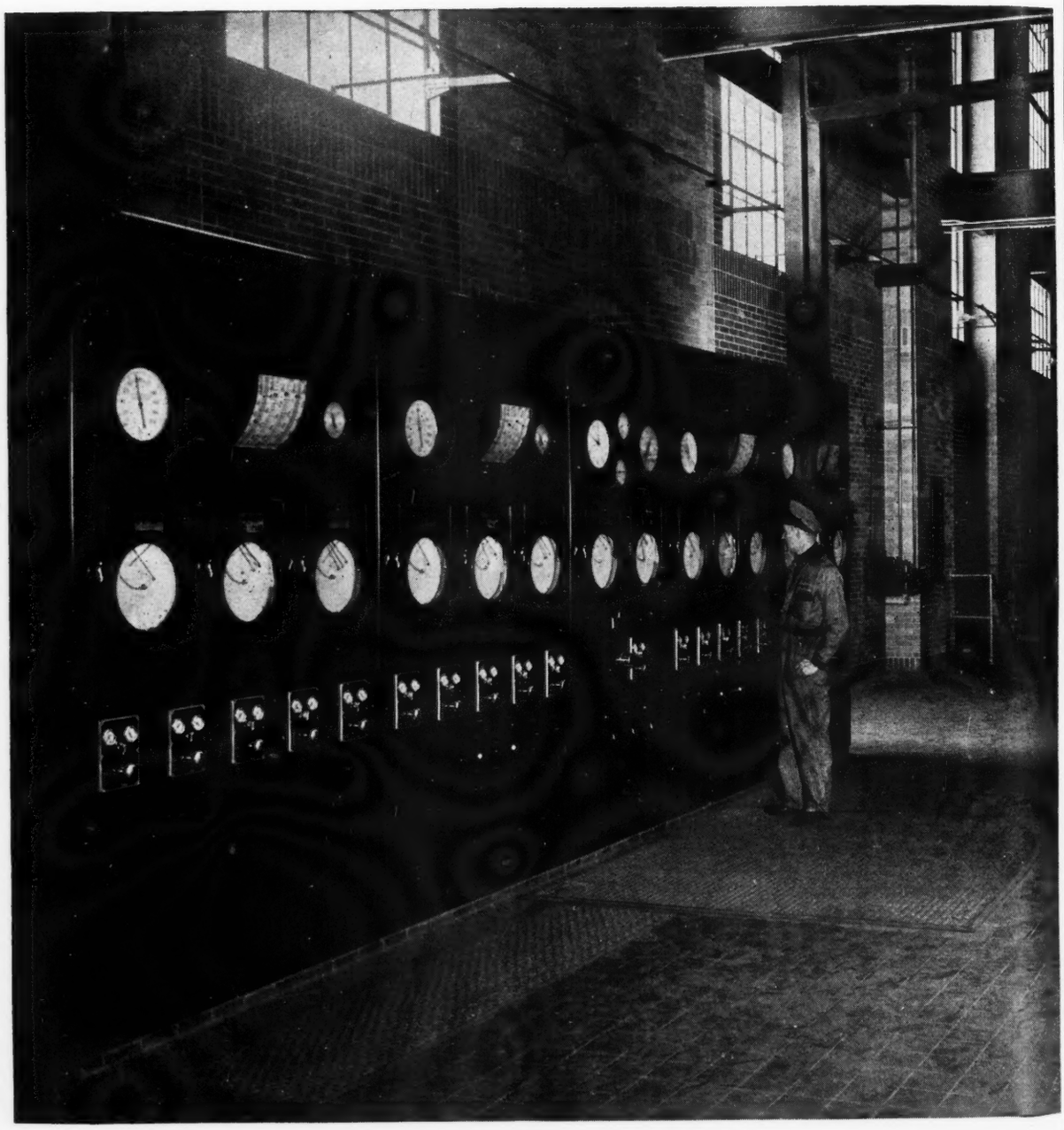


Boiler Control eases

Continuity of Operation, Fuel Can Be Maintained While



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BOILER METERS • MULTI-POINTER GAGES • FLUID METERS • RECORDERS • SUPERHEAT

Manpower Shortage

Economy and Maximum Safety Training New Operators

★ Power Engineers are now faced with the difficult task of operating at full capacity and high efficiency in spite of a serious lack of experienced manpower. Under these conditions complete boiler control is the power engineer's best friend and most trusted lieutenant. It stays on the job continuously and is a valuable aid in carrying on normal operation while new manpower is being "broken in".

It maintains continuity of operation, fuel economy, and maximum safety equally well with experienced or inexperienced operators.

Bailey Boiler Control is a truly complete system. In addition to the usual functions of maintaining steam pressure, regulating furnace draft, and distributing load among boilers, it offers these additional values:

1. An automatic readjustment of the fuel—air ratio which functions continuously to insure economical combustion and safe furnace temperatures day after day.

2. No control system is better than its metering device—in the Bailey System, control impulses are originated by standard Bailey Meters.

3. Provision is made for the protection of steam generating equipment by the addition of purge interlocks, fan failure interlocks and flame detectors.

A helpful discussion on the use of boiler control for war time power plant operation is contained in Bulletin No. 16, "How To Safely Stretch Steaming Capacity." A copy will be mailed to you upon request.

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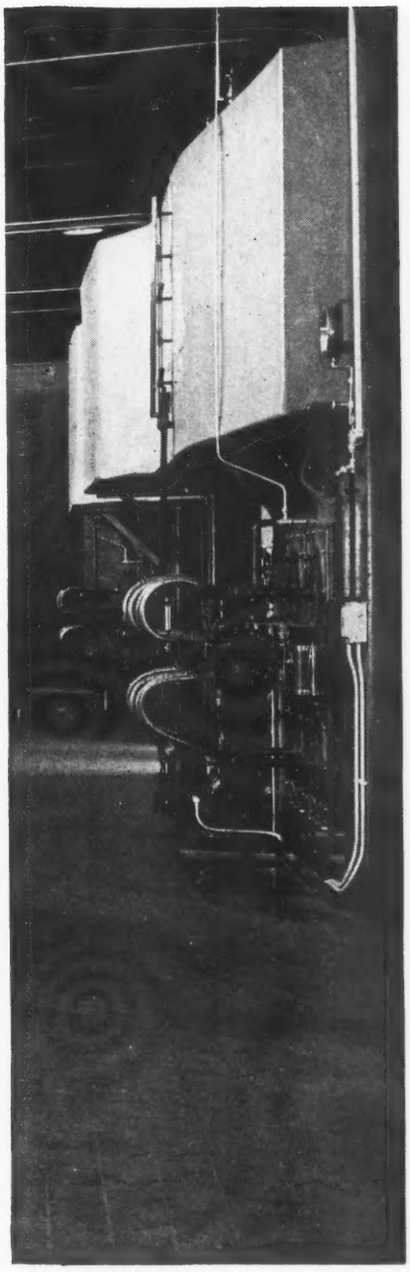

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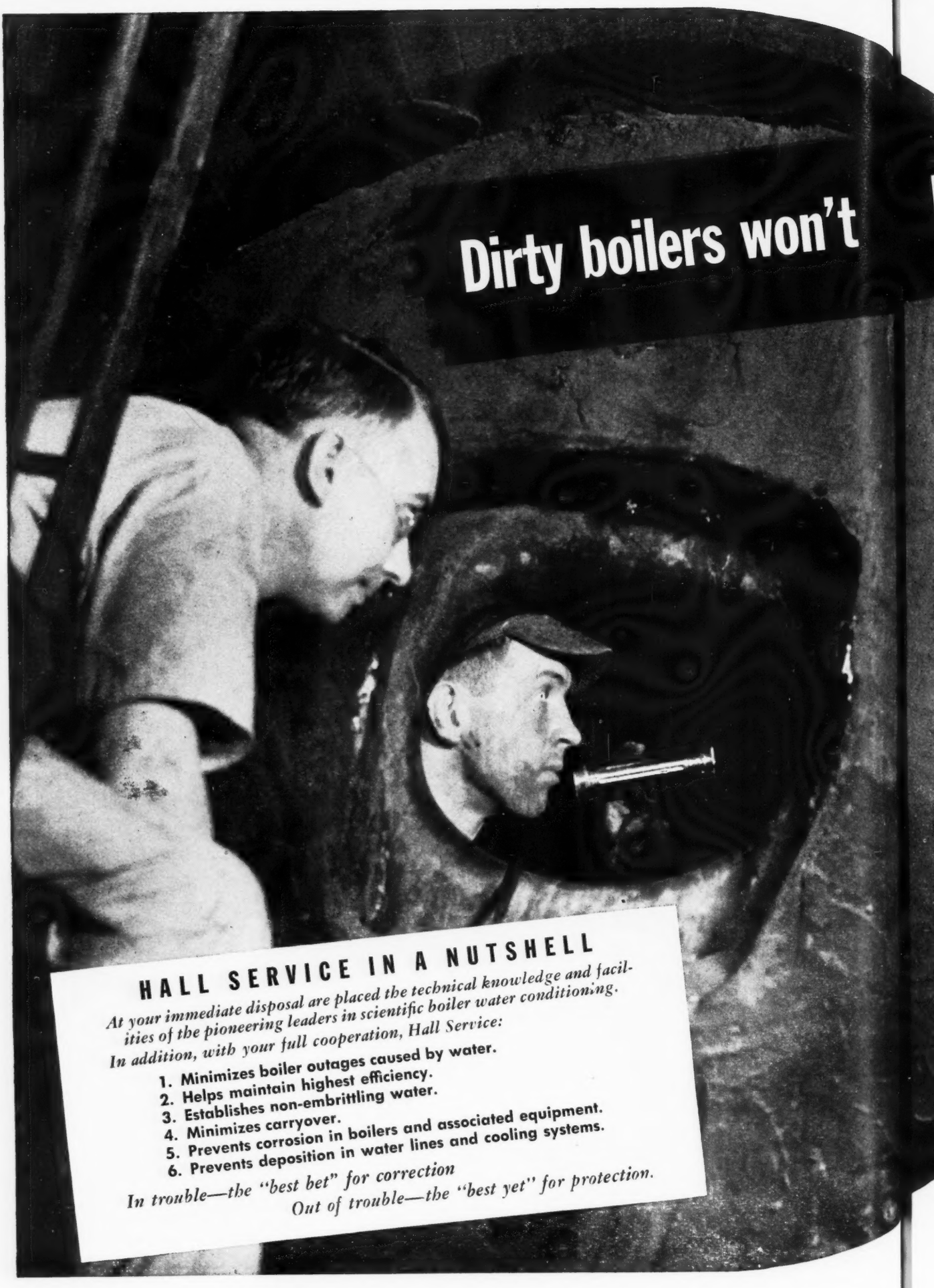
Dirty boilers won't
HALL SERVICE IN A NUTSHELL
At your immediate disposal are placed the technical knowledge and facilities of the pioneering leaders in scientific boiler water conditioning.
In addition, with your full cooperation, Hall Service:
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2. Helps maintain highest efficiency.
3. Establishes non-embrittling water.
4. Minimizes carryover.
5. Prevents corrosion in boilers and associated equipment.
6. Prevents deposition in water lines and cooling systems.
In trouble—the "best bet" for correction
Out of trouble—the "best yet" for protection.

help you break production records!

America's war effort provides enough problems without your having to fight for steam, too

You can't win a battle on the production line while fighting a second front in your power plant.

Dirty boilers suffering from the ills of scale, corrosion, carry-over and embrittlement do more than cause untold harm to your own operations. They seriously impede the flow of critical materials. And they waste supply parts which are rapidly becoming irreplaceable.

How often do you have a boiler down for cleaning and repairs? What preventive measures are you taking? Maybe you've just been lucky. But how long do you think your luck can last?

Dirty boilers, tube failures and other boiler ills don't "just happen" and don't have to happen. There is always a cause, however obscure. These causes can usually be determined long before they become serious.

That is what Hall Service is doing for industrial steam plants — giving them "preventive care," locating trouble causes, pointing the way to their cure. Hundreds of America's war industries are profiting from it today. They've almost forgotten what an unscheduled outage means.

Thoroughness, backed by sound chemical and engineering experience, is the reason why Hall Service could mean so much to your steam output. *It was Hall thoroughness in research which first put boiler water conditioning on a scientific basis.* It is the thoroughness in the training of a Hall Field Engineer which makes him such a valuable ally of the power plant operator.

There was a time when you might have afforded to go without such complete help. We think you'll agree that time has past. May we give you full particulars?

HALL SYSTEM

of Boiler Water Conditioning

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THESE
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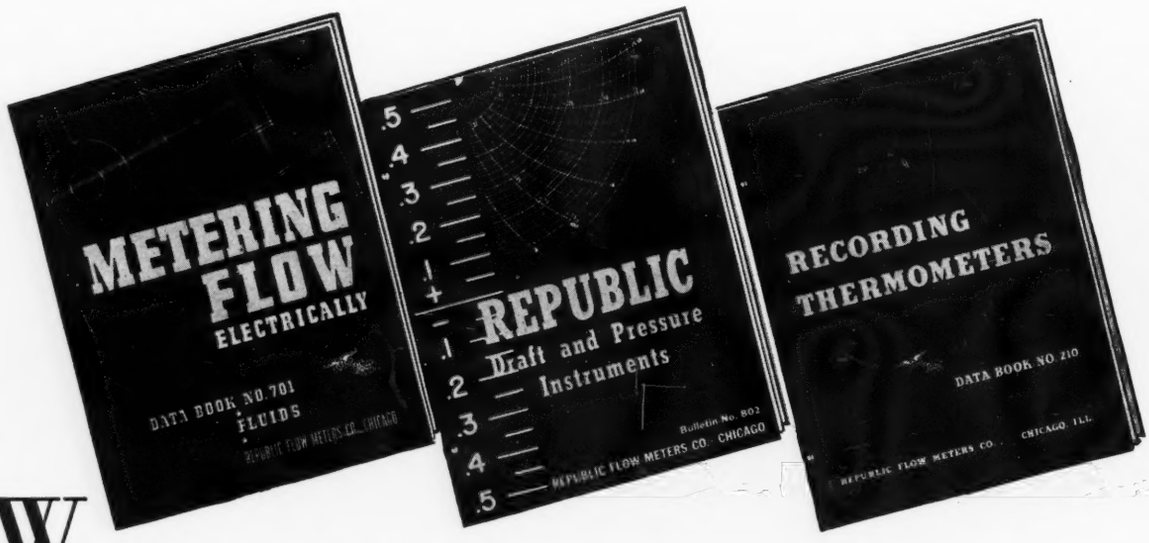
WILL HELP YOU
SOLVE YOUR POWER PROBLEMS



WRITE for these data books now! They are filled with important power plant data generally difficult to locate. When your increased power load demands the installation of new units or the "stretching" of existing plant capacity, you will need this information.

REMOTE READING FLOW METERS — Data Book No. 701

For measuring flow of steam generated by each boiler and the total produced; steam consumed by prime movers and process steam consuming units; water supplied to boilers and pumped to processes; rate of generation, distribution and consumption of natural gas, coke oven gas, compressed air and the like; flow of fuel oil, brine, black liquor and so on; the Republic electrical type flow meter with remote reading instruments, as described in this book, is available.

MECHANICAL FLOW METERS — Bulletins No. 110 and No. 311

When it is desired to measure flow of steam, water, gas, air or oil for the same purposes as outlined above but where remote registration is not required, the Republic mechanical meters described in these books are available.

DRAFT AND PRESSURE INSTRUMENTS — Bulletin No. 802

Proper regulation of draft is one of the most important requirements in obtaining highest combustion efficiency. For indicating and recording drafts, pressures and differentials, Republic indicators and recorders, described in detail in this bulletin, are supplied in any desired combination for all ranges encountered in furnace operation.

EQUIPMENT • FACILITIES • PERSONNEL & EXPERIENCE
REPUBLIC INSTRUMENTS AND CONTROLS

RECORDING THERMOMETERS — Data Book No. 210

Measurements of temperature of flue gas, temperatures in vats or tanks, pipe lines, refrigeration systems, ovens, kilns or ducts and so on, are vital in maintaining highest capacity and efficiency in power plant and process equipment. Republic recording thermometers for this service are described in this data book.

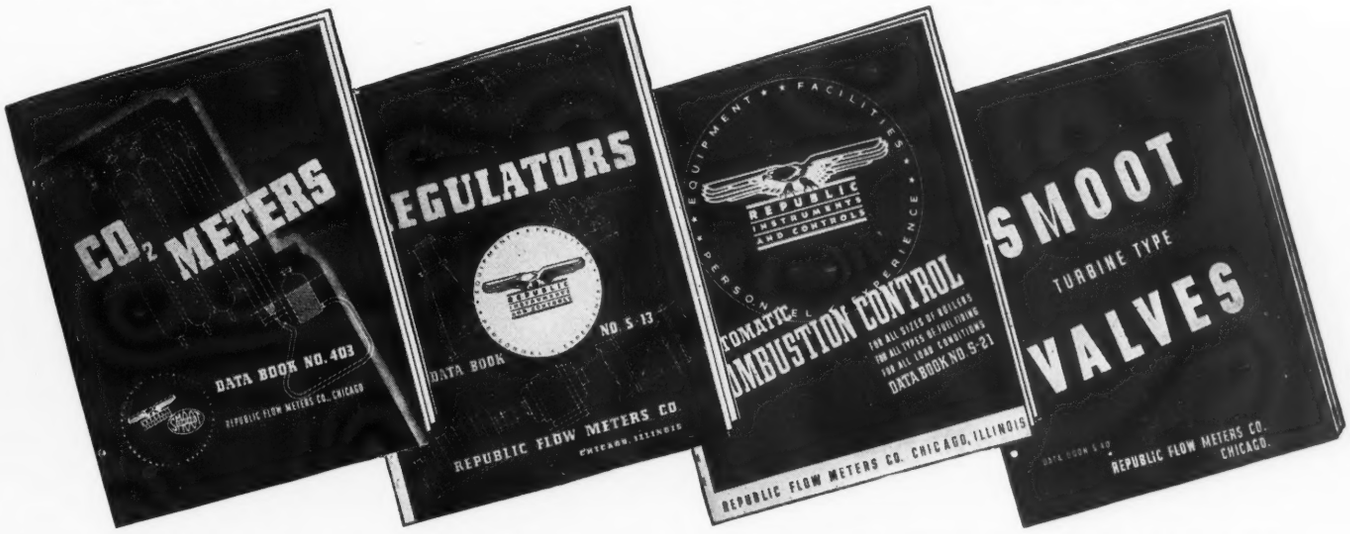
CO_2 METERS — Data Book No. 403

For every fuel and boiler, there is a definite percentage of CO_2 in the flue gas that will assure highest combustion efficiency. The CO_2 meter is the most practical method of determining combustion efficiency. The construction and operation of the Republic CO_2 meter are described in detail in this book.

Republic-Smoot automatic combustion control systems are built for all sizes of boilers, all types of fuel firing and all load conditions, as described in this book, which includes detailed installation reports giving performance data on outstanding power plants.

REGULATING VALVES — Data Book No. S-40

In any plant generating high-pressure, high-temperature steam, there are key valves doing tough jobs in controlling flows or pressures on which vital operations depend — pressure reducing valves co-ordinating high and low pressure steam systems, feedwater valves on 1500 lb. boilers. For such tough jobs, where responsibility, long life and accurate regulation count most and failure must not occur, the Republic-Smoot valves described in this bulletin have been designed.



REGULATORS — Data Book No. S-13

Control of rate of flow of liquids and gases, level of liquids, speed of turbines, engines and motors and proportions between variable pressures and flows must be accurate if maximum plant efficiency is to be attained. These factors are controlled by operation of valves, dampers, rheostats, etc. For sensitive, fast, stable and powerful automatic control of these devices, the Republic-Smoot regulator has been developed. Its construction, operation and applications are described in this book.

AUTOMATIC COMBUSTION CONTROLS — Data Book No. S-21

Boilers must produce maximum steam output at maximum efficiency. That means constant steam pressure, maximum combustion efficiency, constant and correct furnace draft, desired load division among boilers.

DESUPERHEATERS — Data Book No. S-35

In the modern power plant, steam temperatures in interconnected systems — topping turbine bypasses, tie lines, turbine exhaust lines and process steam headers — must be accurately controlled by desuperheaters. For such exacting services, the Republic-Smoot desuperheaters described in this book are employed.

★ ★ ★ ★

Republic Flow Meters Co. offers a complete manufacturing and engineering service in the field of measurement and control. We will be glad to co-operate with you in the solution of any metering or control problem, whether it involves a single instrument or the automatic control of an entire process or plant. Your inquiries will involve no obligation on your part.

Republic Flow Meters Co.

2222 Diversey Parkway • Chicago, Illinois

In Service on
TWO FRONTS

SKINNER Unaflow Steam Engines are serving on two fronts in this war. On the important "industrial front," many SKINNER "UNIVERSAL UNAFLOW" STEAM ENGINES, horizontal and multi-cylinder vertical types, are driving generators that furnish electricity for light and power to some of the nation's best known plants engaged in manufacturing vital wartime materials. Others are driving pumps, blowers, and compressors for refrigeration equipment.

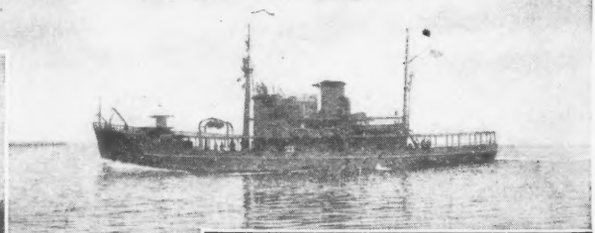
On the "marine front," SKINNER MARINE UNAFLOW STEAM ENGINES are propelling not only industrial ships, ranging in size and type from the small, powerful tug to the world's largest automobile, freight car and passenger ferryboat, but also ships of various types of the Army and Navy.

Our production facilities are being devoted entirely to building SKINNER Engines for the war program.

SKINNER ENGINE COMPANY FOUNDED IN 1868 **ERIE, PA.**

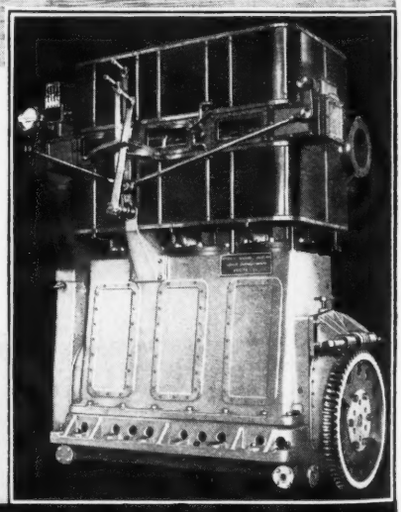
Proudly we fly the Army-Navy "E" Flag, awarded for excellence in production

MARINE

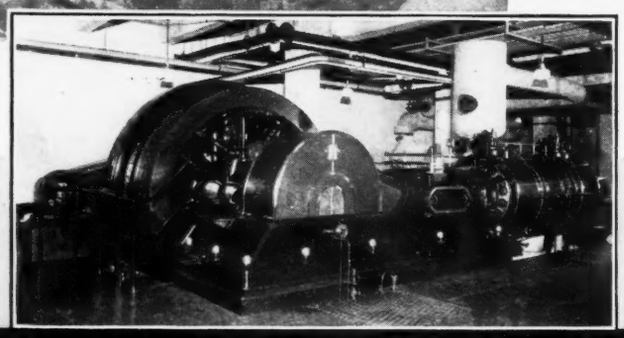


INDUSTRIAL

SKINNER Marine Unaflow Steam Engine

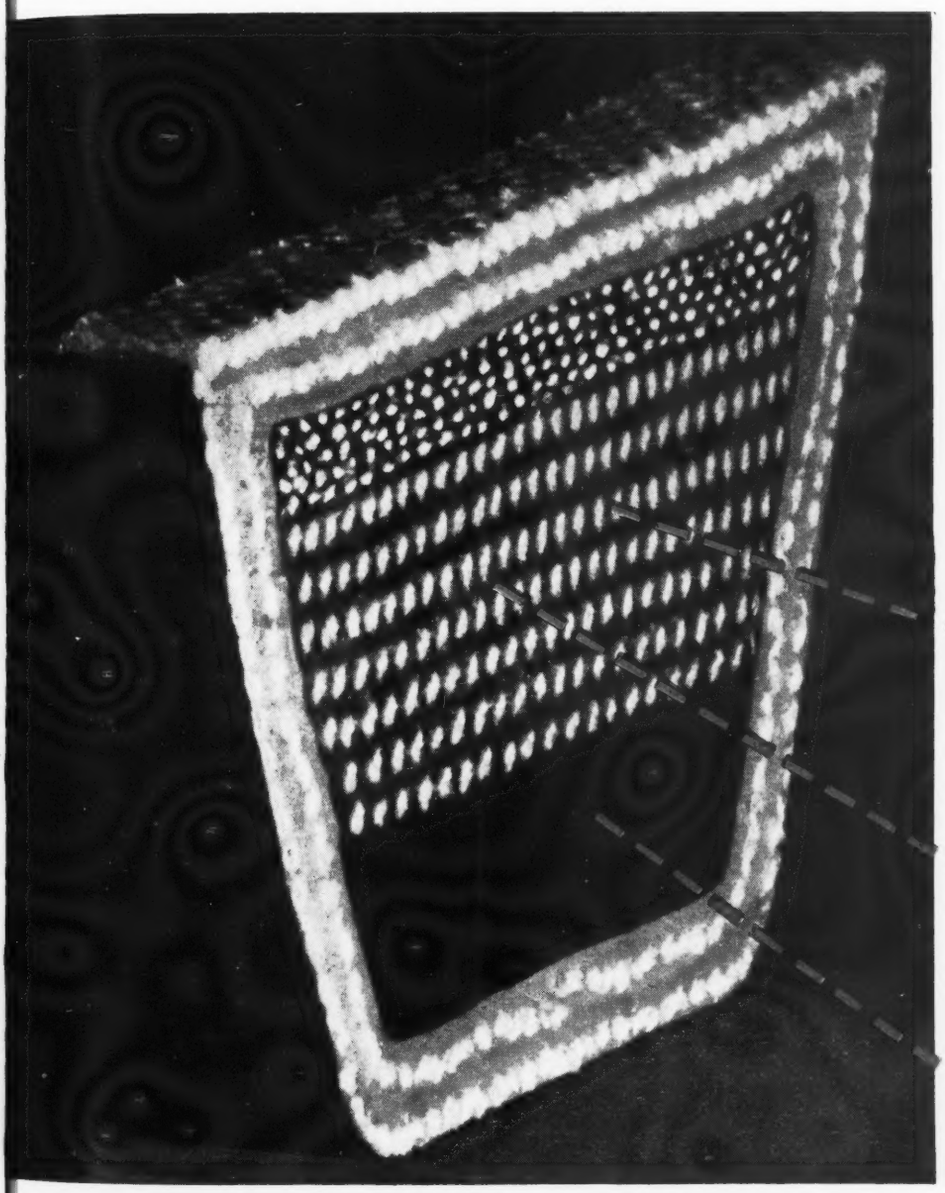


SKINNER Horizontal "Universal Unaflow" Steam Engine



SKINNER UNAFLOW STEAM ENGINES

Here's a Slice of LONGER V-BELT Life!



It's the section of a new Texrope Super-7 . . . and the new ways Longer Life is Built right into it Point to ways *You* can make Your V-belts last Longer.. whatever Brand you Use!

V-Day needs every V-Belt

50% STRONGER CORDS produced by the new Flexon process combat stretching. **YOU** can fight stretching—and the slip and burning that result — by promptly taking up any slack that may develop. Remember, many V-belts are now working four times as many hours a week as in peacetime, may need inspection *four times as often!*

★

20% MORE CORDS than before help protect the new Texrope Super-7 against strains and breaks. **YOU** can minimize breaks in your plant — whatever make of V-belts you use — by requiring that V-belts *never* be pried into grooves. For V-belts, prying is a back-breaking operation!

★

COOLER-RUNNING CUSHION of special rubber "eases" cords around sheaves—for smoother flexing and less heat. **YOU** can fight heat by preventing misalignment. It causes rubbing of belt sides, extra heat and shorter V-belt life. So keep sheave grooves in line—shafts parallel.

★

WHEN YOU DO NEED new V-belts, *invest in the best* — Texrope Super-7!

A 1543

FREE! Every engineer should have this valuable new handbook in his technical library.

It applies to *all* makes of V-Belts—contains no advertising. Write Allis-Chalmers for it *now!*

ALLIS-CHALMERS

WE WORK FOR VICTORY — WE PLAN FOR PEACE

TEXROPE* SUPER-7 V-BELTS

*Trade mark registered U. S. Patent Office. Texrope Super-7 V-Belts are the result of the cooperative research and design genius of two great companies — Allis-Chalmers and B. F. Goodrich — and are sold exclusively by Allis-Chalmers. Available in all sizes,.....½ h.p. to 2,000 h.p.

DEAERATOR CONTROL SYSTEM

Modern boiler operation demands the removal of dissolved air from boiler feedwater to prevent pitting and embrittlement. There are many variables that effect load changes on the boiler, and any load change that causes pressure variations in the Deaerator will decrease the efficiency of the dissolved air removal from the feedwater.

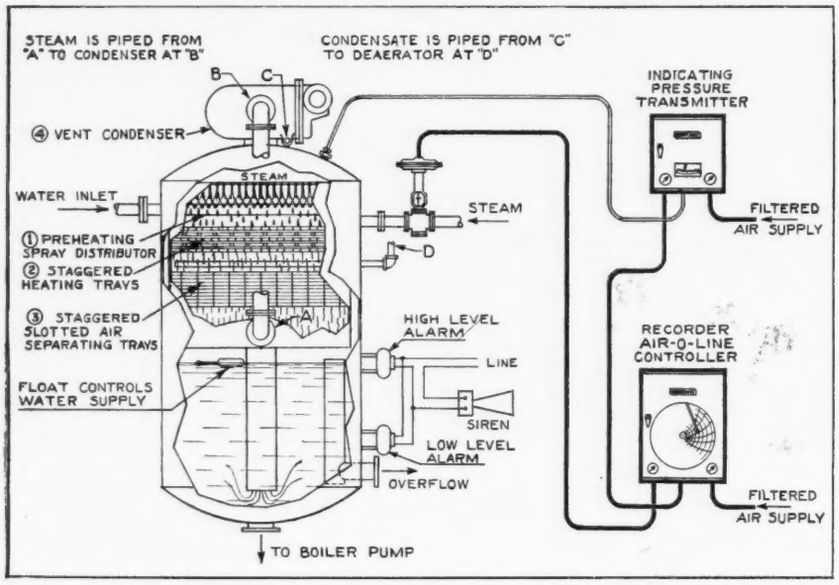


Figure 1. The Brown Remote New-Matic Deaerator Control System regulates steam input according to surges of pressure or flow, and provides reset action to compensate for load changes.

1. Principles Involved

Deaerators are generally located above feedwater equipment and at a point remote from the boiler control panel and, because of the low operating pressures carried on most Deaerators, the water head due to difference of elevation is great enough that sensitive, accurate control cannot be obtained if the deaeration head is suppressed in the instrument. It is therefore desirable to locate the pressure gauge at the level of the Deaerator. On the other hand, the recording controller should be on the boiler panel board. This is convenient when we use remote pneumatic transmission of the pressure to a recording controller located on the boiler control panel or at operating level, with its indicating transmitter located at the Deaerator. The *Brown New-Matic Remote Control System* is ideally suited for this application since it provides an indicating scale at the Deaerator where readings may be desired, and a recorder at any remote point in the boiler house.

The Brown New-Matic indicator mechanism transmits a change in air pressure as required by changes in Deaerator pressure, through a small bore tubing to the remote recording controller.

The transmitter consists of two main parts, the pilot valve and the transmitter mechanism. The purpose of the pilot valve is to amplify the nozzle pressure and greatly increase the volume of air for transmission to the receiving instrument. This pilot is a non-bleed balanced type, using air only when increasing the transmitted air pressure. It is pressure balanced by virtue of a double bellows, one of which is subjected to nozzle pressure and the other to the transmitted air pressure. The pilot valve is capable of increasing the transmitted air pressure for 90% of a total change from 2 to 15 pounds, with 500 feet of connected tubing, in 15 seconds. The same speed of response applies when the valve is exhausting.

A complete cycle of operation for an increase of pressure is given below:

1. With an increase of pressure, the connecting link to the transmitting unit moves to the right.
2. The movement of the connecting link rotates the flapper lifting lever around its pivot, shown just above the nozzle, and moves the flapper pin away from the flapper, allowing it to move downward and throttle the nozzle opening.
3. When the nozzle is throttled, the pressure in the bellows chamber is increased and the bottom of the bellows moves upward compressing the bellows spring. This movement of the bellows forces the bellows rod upward rotating the bell crank about its fixed pivot, and carries the flapper lifting lever with it. This movement continues until the flapper is in the exact position of maintaining the pressure at exactly the value that represents the new pressure, and there is no further movement of the bellows. For a decrease in pressure, the operation is merely the reverse of the above.

The actuating element of the Brown New-Matic receiver is similar to the transmitting unit except that it has no flapper and nozzle. The bellows and bellows springs are identical with those used in the transmitter unit and linear calibration is always obtained.

The liquid level alarm system is comprised of two Minneapolis-Honeywell high pressure water level cut-off switches mounted in such a way as to sound an alarm when the water levels are above or below the proper levels.

2. Application Data

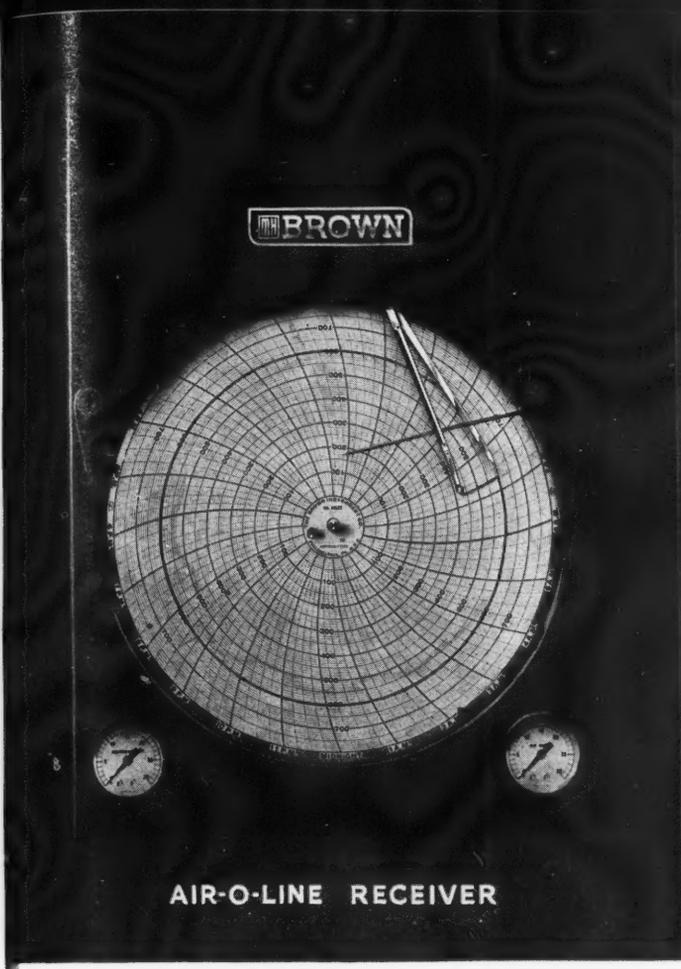
There are two common types of feedwater heaters—the closed or indirect type, which consists of a tubular heat exchanger with water in the tubes and steam in the space surrounding them, and the open or contact type, in which the steam and water are in direct contact. Each has its application: the first, where exhaust steam contains considerable oil or where high temperatures are required, and the latter, where deaeration and purification are desired and limited temperatures are sufficient.

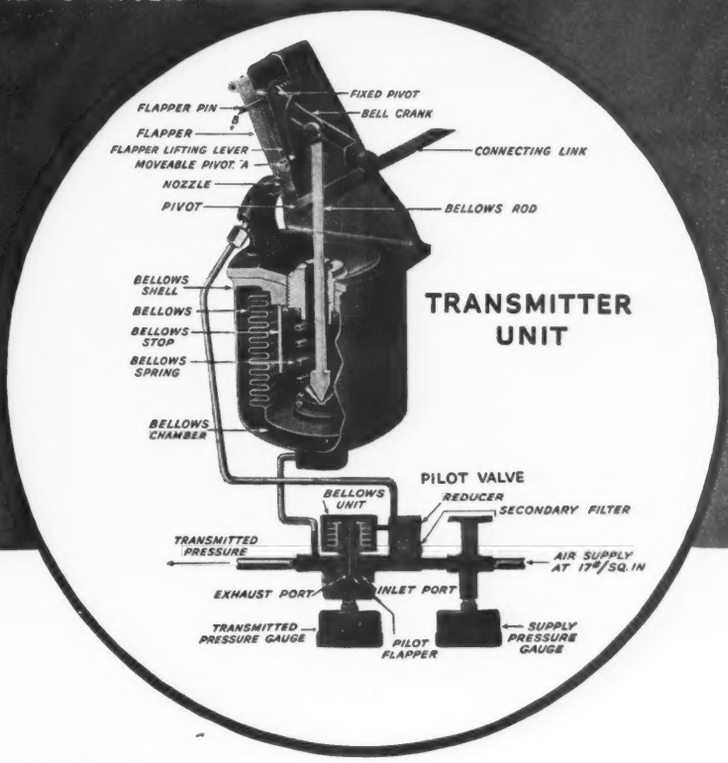
Open heaters usually operate at from 1 to 5 pounds pressure and as the steam and water are mixed, both latent and sensible heat of the steam is absorbed by the water, resulting in a feedwater temperature being within ½° F. of the temperature of the steam at the heater operating pressure. Temperature control is extremely critical if deaeration is desired, and if steam binding in the feed pumps is to be avoided. The water temperature must be maintained constantly within ± 1° F. of the boiling point which is the equivalent of a pressure change of approximately ⅛ lb. Unless sufficient quantities of exhaust steam are available at all times to insure this condition, a live steam cross over should be employed including a reliable and sensitive pressure regulator. Only under these conditions may complete removal of oxygen and other non-condensable gases such as CO_2 be accomplished. These gases are continuously vented to atmosphere, usually through a vent condenser, or heat exchanger. Steam binding of pumps, while no problem on a temperature rise, will always show on the slightest drop in temperature.

The Brown Deaerator Control System is particularly desirable because it has the following characteristics:

1. Responds to pressure changes, rather that temperature changes, therefore responds to minute variations in conditions.
2. The New-Matic principle permits the use of remote transmission methods, and avoids errors due to water leg in tubing.
3. Control point may be adjusted conveniently at the panel board.
4. The transmitter is equipped with an indicating scale at the Deaerator.
5. If desired, the water level in the Deaerator may be recorded on the same chart as the pressure, by the simple addition of a level receiver unit in the recorder and an indicating level transmitter at the Deaerator.

For complete details write THE BROWN INSTRUMENT COMPANY, *a division of Minneapolis-Honeywell Regulator Co.*, 4490 Wayne Avenue, Philadelphia, Pa.





Centralizes Remote Measurement and Control of DEAERATOR

All Brown "New-Matic" Systems are equipped with identical bellows in both the transmitting and receiving instruments. These bellows are factory "matched" to rigid specifications, insuring accurate calibration throughout the pressure range.

RESPONSE

Rapid rate of response is obtained through the use of a new non-bleed pilot. With tubing lengths as great as 1,000 feet, the receiver pen will travel through full scale at a rate equivalent to the most rapid rate of mercury differential change ever encountered in flow meter practice. With the thermometer transmitters it has been proven that the response is even more rapid than with long lengths of capillary.

ACCURACY

Positioning of the recording pen is guaranteed to within 1/10 of 1% of full scale range. Precision workmanship in all moving parts eliminates any appreciable hysteresis errors. The system is unaffected by ambient temperature changes of fluctuating air supply pressure.

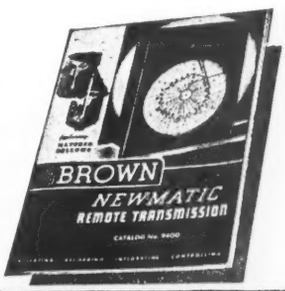
POWER

The extra large spring and bellows design insures ample power for pen positioning and control mechanism operation. There is no "pen drag" or tapping error.

The Brown "New-Matic" Remote Transmission System is safe, stable, accurate and powerful, and lends itself admirably to the growing demand for centralized recording and control without any of the drawbacks attendant to long lengths of meter piping or capillary tubing, and where the use of electricity is not desirable.

Send for Catalog 9400

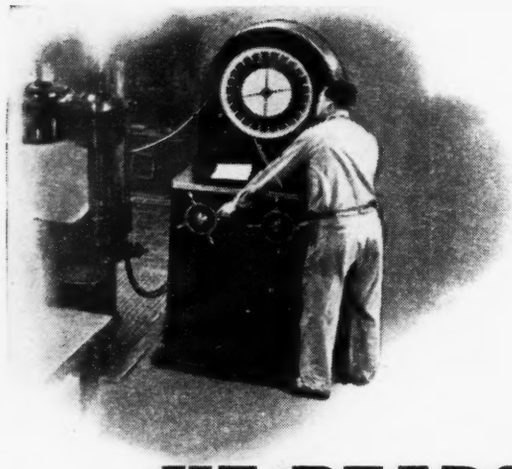
Write THE BROWN INSTRUMENT COMPANY, 4490 Wayne Avenue, Philadelphia, Penna. Offices in all principal cities.



BROWN *NEW-MATIC* TRANSMISSION SYSTEM

THE BROWN INSTRUMENT COMPANY, PHILADELPHIA, PENNSYLVANIA
DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR CO.
MINNEAPOLIS, MINNESOTA, AND 119 PETER STREET, TORONTO, CANADA

TO MEASURE AND CONTROL IS TO ECONOMIZE



HE READS THE *"Life-lines"* OF GLOBE PRESSURE TUBES

The life expectancy of a Globe Pressure Tube is an open book to the Globe metallurgist. Frequent laboratory tests, including photomicrographic inspection, in addition to careful and thorough individual gauging for wall thickness and outside diameter, insure a consistently uniform quality of product.

Such extra precautions in manufacture may readily be translated into longer life and greater safety in use. This extra margin of safety and strength means lower cost in the long run for the user of Globe Pressure Tubes.

Globe Engineers are always available to assist in selecting a tube with the exact characteristic you require.

GLOBE STEEL TUBES CO., Milwaukee, Wis.

STAINLESS TUBES
BOILER TUBES
CONDENSER AND HEAT EXCHANGER TUBES
MECHANICAL TUBING

GLOBE STEEL *Tubes*

GLOBE TUBES

4 SIMPLE STEPS to Save

*Months of Time and *Tons of Vital Materials

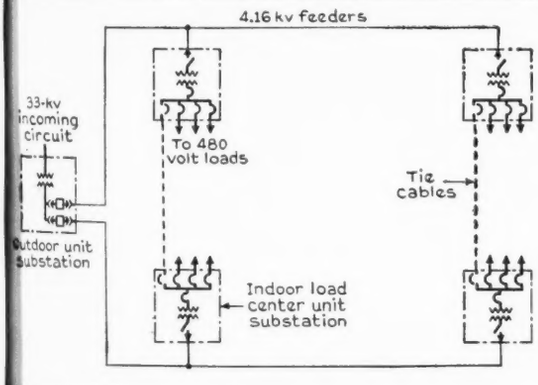
—in Getting Electric Power to New Production Machinery

1. Decide on a modern load-center distribution system using load-center unit substations.

2. Make a simple, one-line electrical layout of your proposed plant.

3. Specify standard equipment; standardization means you get better equipment more quickly and at lower cost.

4. Order your electric equipment as soon as possible so that it will be available for immediate installation when construction has progressed far enough.



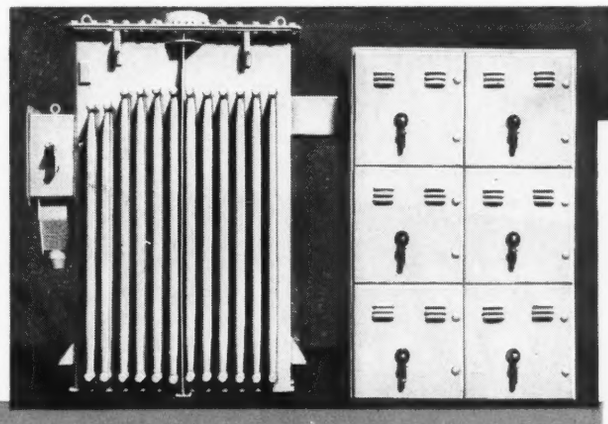
A typical one-line diagram of a load-center distribution system, with power being distributed at high voltage (2.4 to 13.2 kv) to unit substations located near the centers of electrical load areas—eliminating long, heavy, low-voltage feeders from a distant large substation. Thus, you save tons of copper, and the performance of motors, lamps, etc., is improved because of the reduction in voltage drop.

BY following these steps in General Electric's plan to provide standard load-center distribution equipment in the shortest time possible, you can save from *one to six months* of the time ordinarily required. You eliminate hours and hours at the drawing board, and long, drawn-out correspondence.

What's more, load-center distribution saves tons of steel, copper, and other vital materials; installation time is quicker, and service better.

To help you get your equipment specified, purchased, and installed under this new, short-time plan, a new "handy guide" is just coming off the press. Mail the coupon for your copy today. *General Electric, Schenectady, N. Y.*

General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance



Factory-assembled, safety-metal-enclosed unit substations are quickly and easily installed right at load centers—without expensive vault construction, thanks to Pyranol. Simply slide the completely assembled sections into position and connect to the primary and secondary cables.

GENERAL ELECTRIC

General Electric Co., Sec. F 302-10
Schenectady, N. Y.

I understand your new handy guide to "Quickly Installed Electric Power Systems" (GED-1006) explains in detail the steps to follow in order to get power to new production machinery in one to six months less time. Please send me a copy.

Name.....

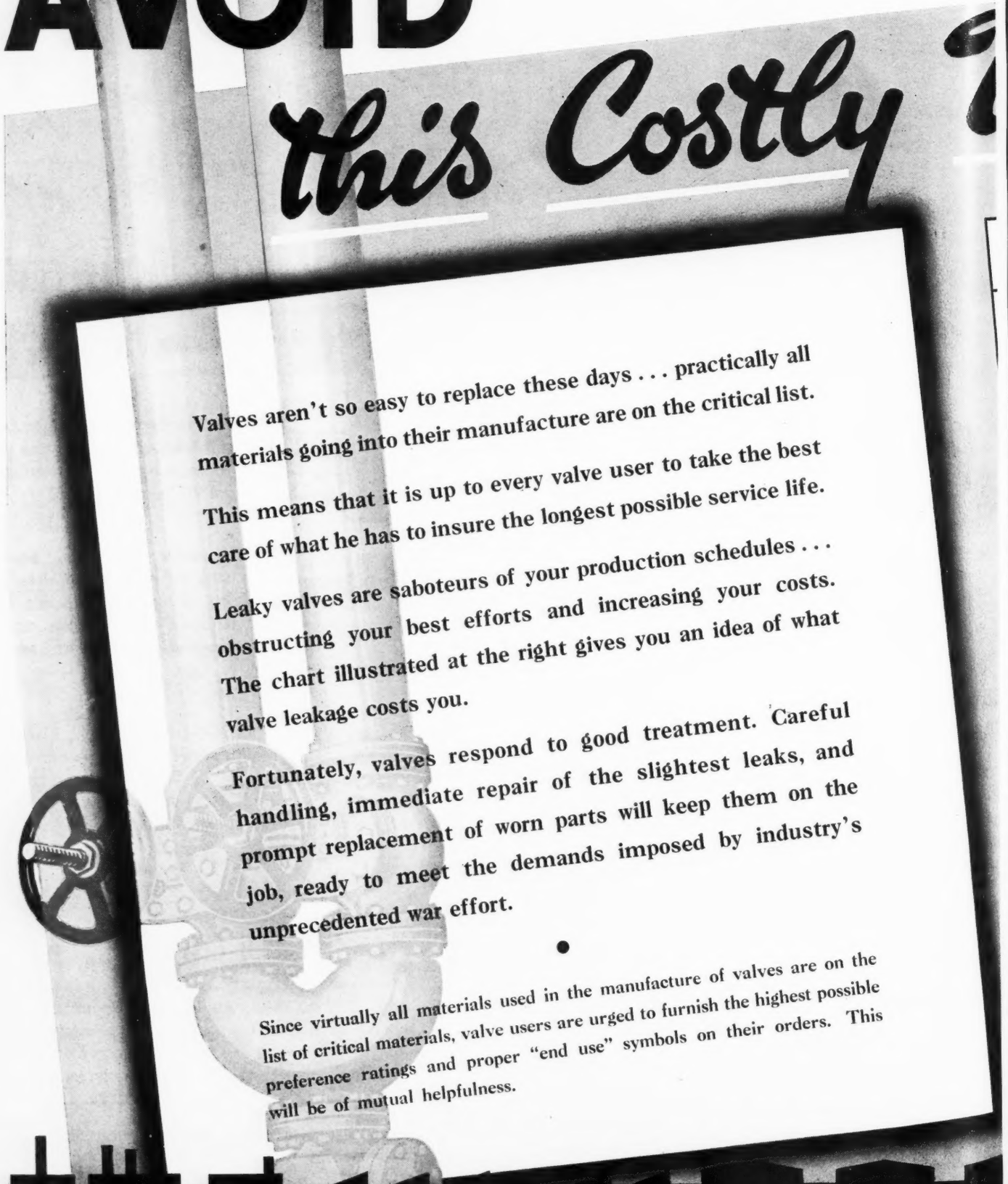
Company.....

Address.....

City..... State.....

302-10-170E

AVOID this Costly



Valves aren't so easy to replace these days . . . practically all materials going into their manufacture are on the critical list.

This means that it is up to every valve user to take the best care of what he has to insure the longest possible service life.

Leaky valves are saboteurs of your production schedules . . . obstructing your best efforts and increasing your costs. The chart illustrated at the right gives you an idea of what valve leakage costs you.

Fortunately, valves respond to good treatment. Careful handling, immediate repair of the slightest leaks, and prompt replacement of worn parts will keep them on the job, ready to meet the demands imposed by industry's unprecedented war effort.

•

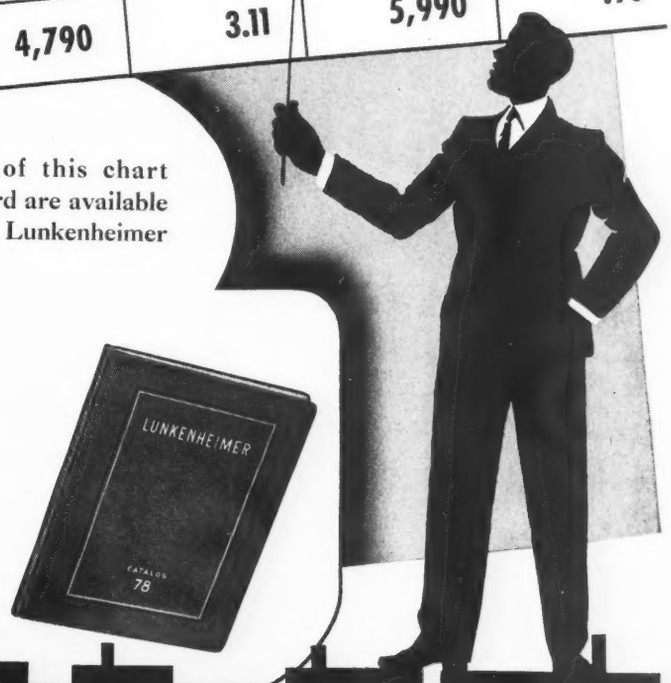
Since virtually all materials used in the manufacture of valves are on the list of critical materials, valve users are urged to furnish the highest possible preference ratings and proper "end use" symbols on their orders. This will be of mutual helpfulness.

LUNKENHEIMER

Valve Leakage

AREA OF LEAK	AIR		STEAM		WATER	
Diameter Inches	Number of cubic feet per month at 75 lb. pressure	Total cost of waste per month 11c per 1000 cubic feet	Pounds wasted per month at 160 lb. pressure	Total cost of waste per month 65c per 1000 lb.	Gallons wasted per month at 60 lb. pressure	Total cost of waste per month 16c per 1000 gallons
1/2"	13,468,000	$1,481.44	1,219,280	$792.53	1,524,100	$243.86
3/8"	7,558,500	831.44	684,290	444.79	855,360	136.86
1/4"	3,366,990	370.37	304,820	198.13	381,020	60.96
1/8"	824,570	90.70	74,650	48.52	93,310	14.93
1/16"	213,000	23.43	19,280	12.53	24,110	3.80
1/32"	52,910	5.82	4,790	3.11	5,990	.96

Enlarged copies of this chart printed on cardboard are available on request; also Lunkenheimer Catalog 78.



ESTABLISHED 1862

THE LUNKENHEIMER CO.

"QUALITY"

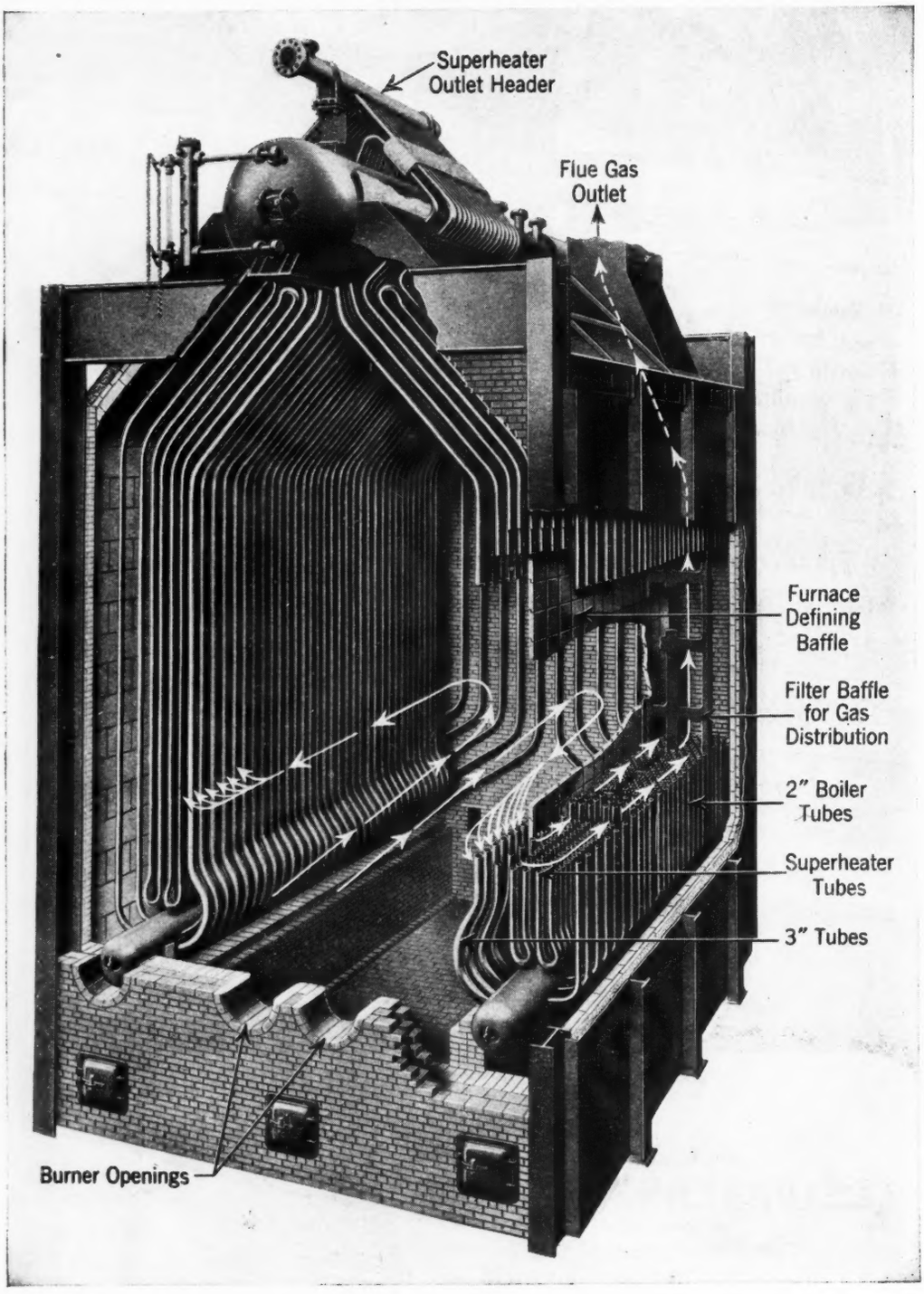
CINCINNATI, OHIO. U. S. A.

NEW YORK CHICAGO
BOSTON PHILADELPHIA

EXPORT DEPT. 318-322 HUDSON ST., NEW YORK

VALVES BOILER MOUNTINGS LUBRICATING DEVICES

Maximum Steam Production



"S-A" BOILER

FOSTER

Per Ton of Boiler Drum Plate

—a WARTIME NECESSITY

MAXIMUM STEAM FROM MINIMUM MATERIALS IS IMPERATIVE IN NEW BOILERS

The single drum, S-A boiler meets these war priority requirements. In addition it

1) **Incorporates the advantages and performance of two drum, bent tube, water cooled furnace units.**

2) **Requires but one welded drum**

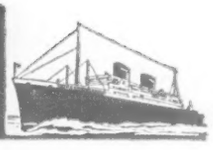
3) **Effects great reduction in total drum plate requirements**

4) **Doubles the number of boilers from one welding shop.**

SINGLE DRUM "WAR" BOILERS OFFER MOST SPEEDY DELIVERY AND ARE IN GREATEST DEMAND

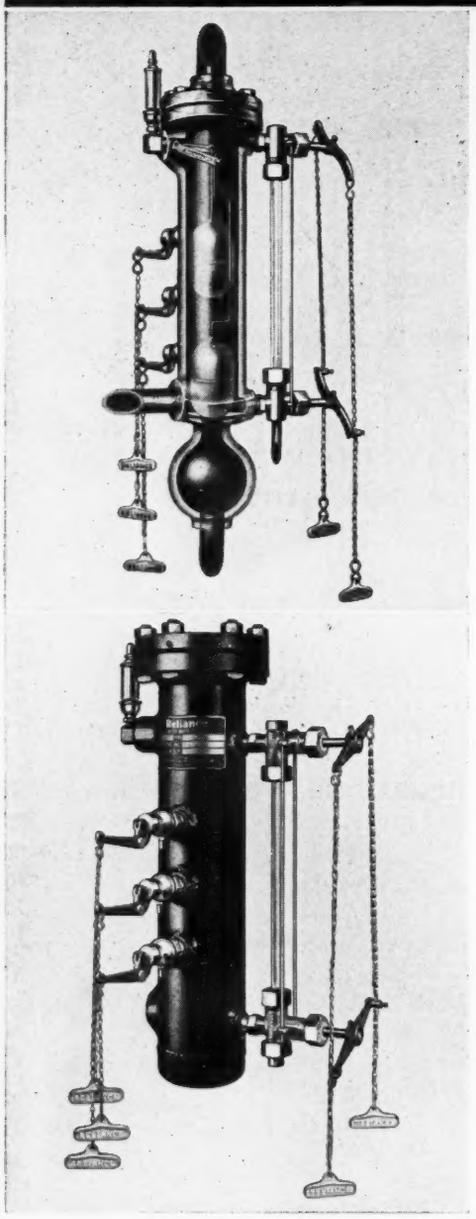
FOSTER WHEELER CORPORATION, 165 BROADWAY, NEW YORK, N. Y.

WHEELER



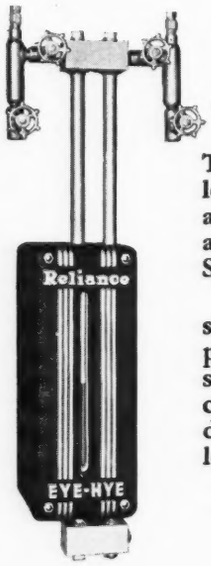
Protect the power for Maintenance

. . . It is <u>not</u> unpatriotic to buy Equipment and Parts to assure steady production—to guard against delays and breakdowns



Reliance ALARM WATER COLUMNS

Reliance ALARMS — standard equipment with most boiler makers — are made for all types of boilers and for all pressures to 900 lbs. They may be either high-and-low alarm or low alarm only. Float-operated mechanism is sensitive, reliable. Write for bulletin 414. Also water columns without alarms built to specifications. . . . All ALARM parts are replaceable. Form 429 includes instructions for installing, for replacing parts, and parts list.

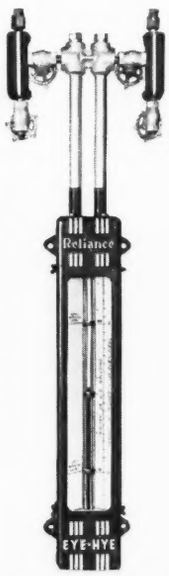


Reliance EYE-HYE REMOTE READING WATER LEVEL INDICATOR

The EYE-HYE provides accurate, eye-level reading for boilers and other tanks and vessels; can be conveniently located any reasonable distance from the drum. Self-illuminated. Easy to install.

Models for all working steam pressures, for wall or panel mounting. Low pressure models for feed water heaters, surge tanks, etc., are calibrated for precise reading and fitted with scale to indicate in gallons, proportionate tank levels, etc.

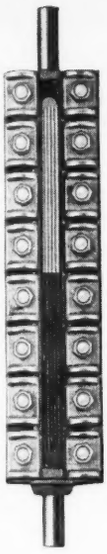
Write for Bulletins 382-B and C.



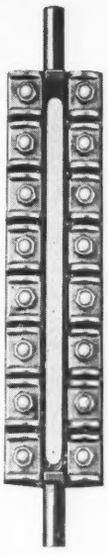
Since 1884

Reliance

your War Production with Strict of your Boiler Safety Devices



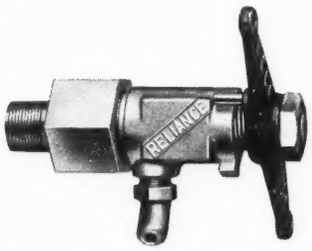
Reliance WATER GAGE INSERTS

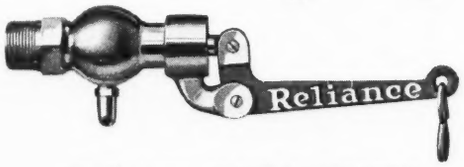


Almost all liquid level gaging applications call for something sturdier than tubular glass. The hazard of personal injuries demands safety inserts such as . . .

Prismatic Inserts for sharp distinct reading. Semi-steel, steel, or bronze bodies; shatter-proof heat treated glass. Single or multiple window models for all visibility needs.

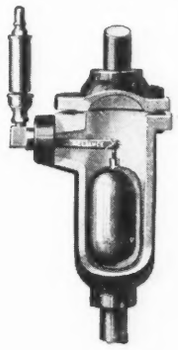
Mica-protected Flat Glass Inserts are efficient, shatter-proof indicators, made for pressures to 1500 lbs. Forged steel bodies; heat treated flat glass protected by sheets of mica. Single and multiple models.





Reliance GAGE COCKS

Heavy duty, forged steel construction, stainless trim: No. 302, ¾" thread shank. Spring type for pressures to 450 lbs.: No. 300, ½" and 301, ¾" thread shank. Weighted type for pressures to 250 lbs.: No. 310, ½" and 311, ¾" thread shank. Write for Gage Cock Bulletin.



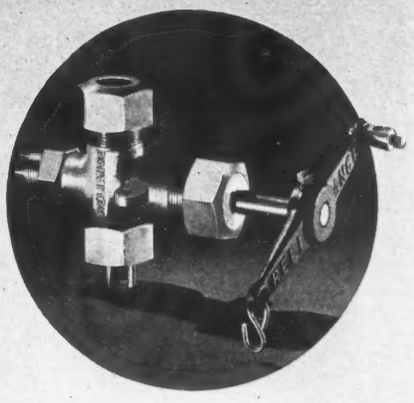
Reliance JUNIOR HIGH or LOW ALARM

For pressures from 5 to 200 pounds. Whistle or electric signal. Write for Bulletin 410.

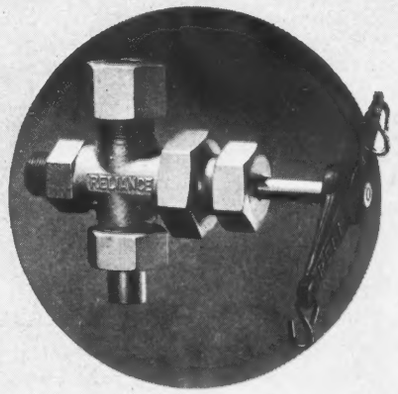
Reliance Representatives in all principal cities are experienced in power engineering problems — will be glad to help you.

THE RELIANCE GAUGE COLUMN COMPANY • CLEVELAND, OHIO

Reliance GAGE VALVES



Pressures to 250 lbs.: No. 402-R, ½" and 403-R, ¾" thread shank; 502-R with flanged connection. Pressures to 450 lbs.: No. 404-R, ¾" thread shank; 503-R with flanged connection. Pressures to 900 lbs., forged steel construction: No. SG454, ¾" thread shank; SG460 with ASA flange. Write for Bulletin 418.



BOILER SAFETY DEVICES

Their Lives Depend On "How Much...How Soon"

Avoid Frequent Shutdowns!

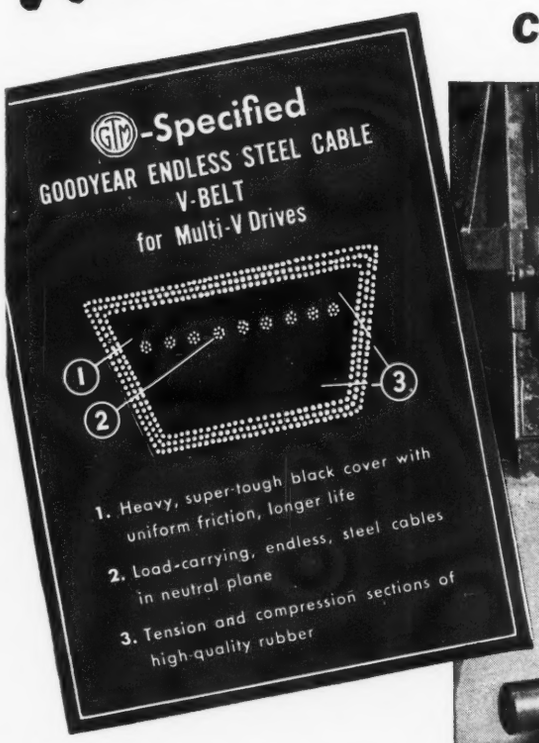
FREQUENT interruptions for repacking and replacement of gaskets and oil seals can be avoided by using quality materials at the start. GARLOCK quality products are helping industry maintain non-stop, all-out production schedules all over the country.

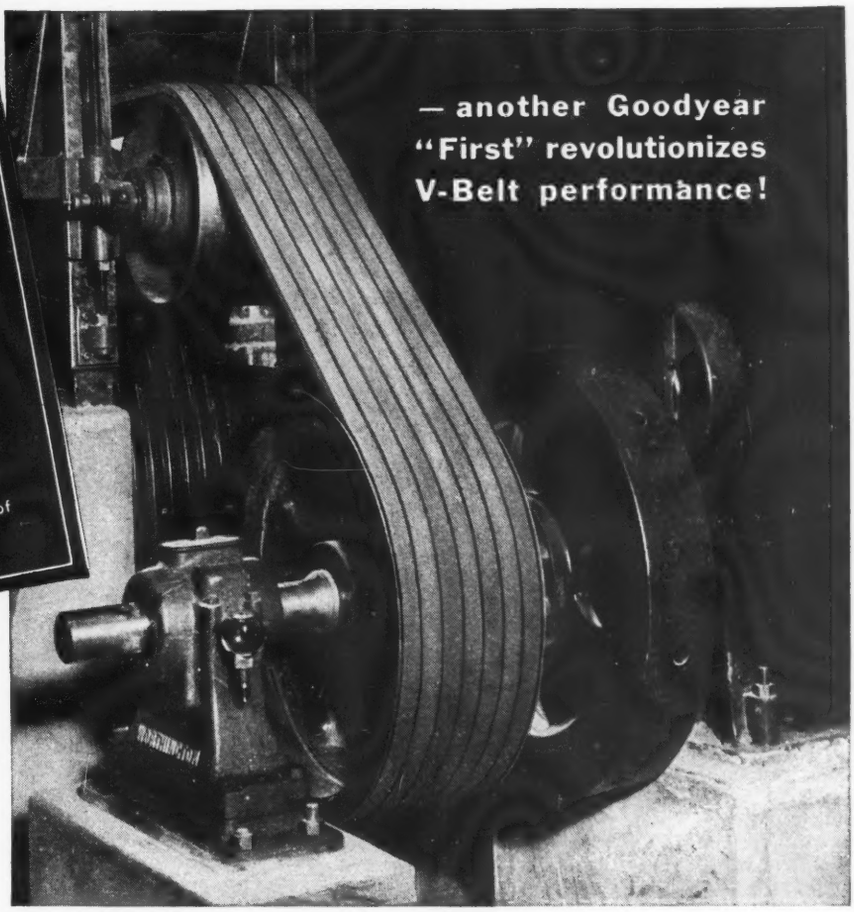
Garlock

THE GARLOCK PACKING COMPANY
PALMYRA, NEW YORK
In Canada: The Garlock Packing Co. of Canada Limited, Montreal, Que.

Here's THE ULTIMATE V-BELT

Constructed with endless steel cables





AFTER many months of research, development and field operation on the hardest drives, work has just been completed on another Goodyear "First"—the V-belt of the future, built with endless steel cables in place of conventional cotton cord construction.

In exhaustive tests this new Goodyear Endless Steel Cable V-Belt has averaged more than SEVEN times longer service-life than the best cotton cord belts — with less than ⅕ of 1% stretch.

The outstanding advantages of the Goodyear Steel Cable V-Belt, the latest addition to the outstanding line of Black E-C Cord Multiple V-Belts, make it possible to engineer Multi-V drives where space limitations and other engineering factors formerly denied their usage.

Greater Strength Factor: far heavier drives can now be changed over to economical Multi-V operation.

Highest Heat Resistance: proved on U. S. Tanks.

Minimum Stretch: practically zero stretch with fewer adjustments.

Uniform Stretch: every belt takes its proportional share of the load, giving smoother operation.

Far Longer Life: lowest over-all cost for heaviest drives.

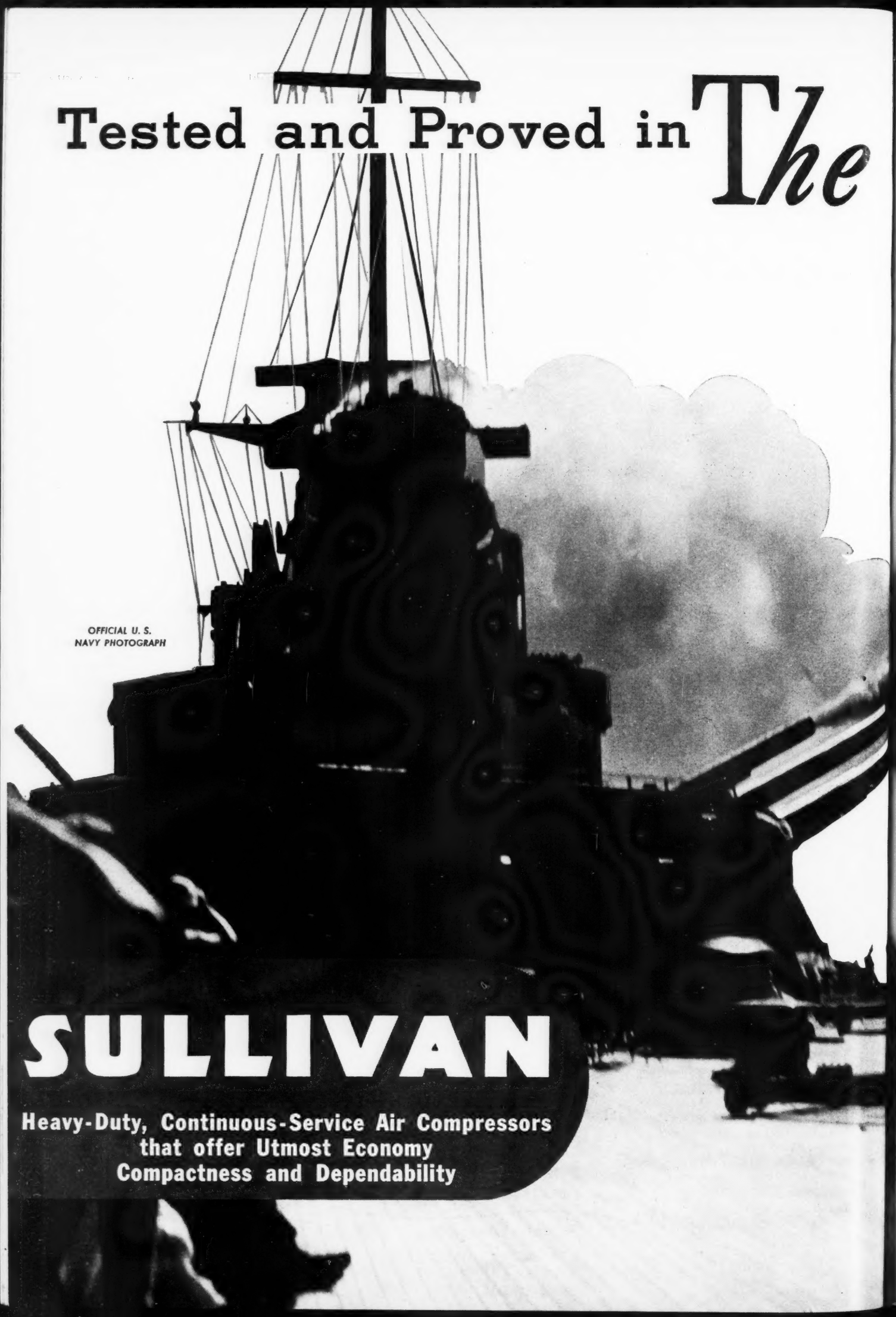
So successful is this construction proving, that new high standards are set in all phases of Multi-V drive performance and wartime production is speeded up. Its many advantages and economies are another Goodyear "First"—a triumph of G. T. M. rubber engineering — at present only available for special war jobs and critical drives for war work operation.

For complete information, consult the G. T. M. — Goodyear Technical Man — or write Goodyear, Akron, Ohio, or contact the nearest Goodyear mechanical goods distributor.

E-C Cord—T.M. The Goodyear Tire & Rubber Company

PROVED ON U. S. TANKS — ordinary fan belts "burn out" in a few hours — Goodyear Steel Cable V-Belts last months!

Tested and Proved in *The*



OFFICIAL U. S.
NAVY PHOTOGRAPH

SULLIVAN

Heavy-Duty, Continuous-Service Air Compressors
that offer Utmost Economy
Compactness and Dependability

Crucible of War

● Midway... Coral Sea... Solomon Islands... sagas of the fighting forces of Uncle Sam. But they are also tributes to American industrial research, to developments that will make for even bigger and better victories. They are tributes to the strong, tough, light alloys that increase the ability of ships and planes to take it and to dish it out; tributes to developments in fluid and aerodynamics and other fields that increase firing power, speed, maneuverability and *deadliness.*

They bring a message to every man who buys equipment for war production today and for peace production tomorrow. For Sullivan Package Type Compressors ... *used almost universally in the manufacture of modern American weapons* ... reflect the same advanced and battle-proven principles of design, metallurgy and aerodynamics. The superior performance of Sullivan Package Type Compressors is also attested by the second and third and fourth reorders from companies whose prominence and importance in the Battle of Production do not permit them to make mistakes in judgment. SULLIVAN MACHINERY COMPANY, 932-A Woodland Ave., Michigan City, Indiana. Branch Offices and Representatives in all large cities. *Associated House:* Canadian Sullivan Machinery Co., Ltd., Dundas, Ont.

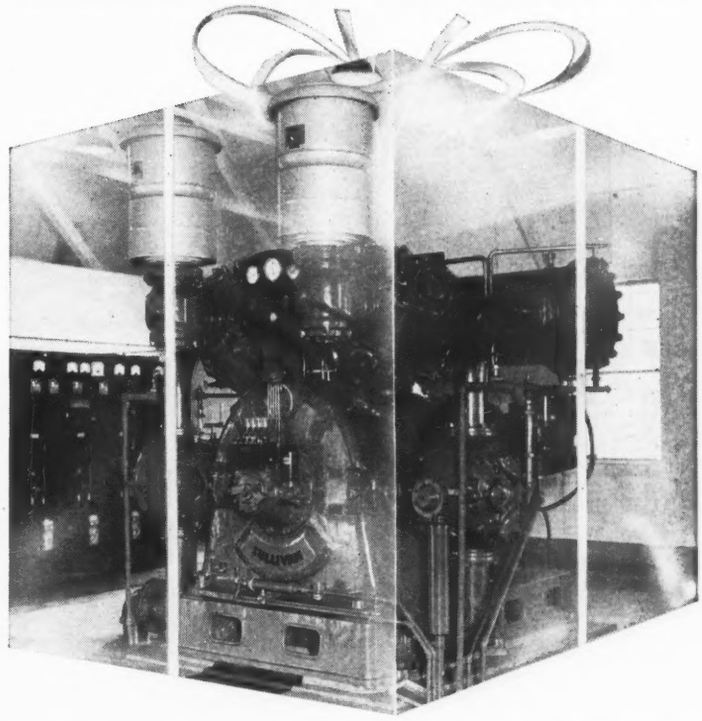
The problems faced by *any* designer

In a mechanized world, at war or at peace, achievement depends to an ever widening degree on man's ability to master the secrets of matter in motion and under stress.

This is as true of the battleship as it is of the fighter plane ... as true of the air compressor as it is of the automobile.

The designer of a machine to compress air is faced by the same kind and variety of problems... among them the stresses and strains set up by masses of metal moving at high speed, the behavior of gases under high pressure, the friction set up by various surfaces and contours, the necessity to find ever greater strength, durability, compactness and weight-saving through the most effective use of modern metals and alloys.

Correct answers to these problems have made Sullivan Package Type Compressors extremely dependable, economical, compact and long-lived.



SULLIVAN PACKAGE TYPE COMPRESSORS

From 378 to 3656 C.F.M. Complete, compact, self-contained, long-lived, heavy-duty units for continuous service. They are two-stage, double-acting. Much smaller than old-style compressors with same capacity, they offer great savings in installation time, space, materials and labor, and equal or greater operating economies. Sullivan Package Type Compressors arrive ready to be hooked up to power, water and air lines and go into 24-hour per day service. Particularly suited for synchronous motor drive; well adapted for steam turbine or diesel drive.

Also a complete line of compressors from ¼ to 3000 h.p. Heavy or intermittent duty. Single or two-stage. Angle, V-Vertical, Vertical, Horizontal or Portable.

COPYRIGHT 1942 — JONES & LAUGHLIN STEEL CORPORATION

THROUGHOUT THE NIGHT DETERMINED

Like commandos on attack, stalwart steel men come in the dead of night to work till dawn, grim in their determination to produce speedily the fighting steels to arm your sons and brothers on the battle fronts. On the night-turn, thousands strong, come men like the metallurgist who added the final touch in perfecting a new armor steel; like the melter who now makes that steel two-hundred tons at a time.

There come men who roll wide steel plates for ships and miles of tubes for bombs and those who forge and machine glistening shells from steel made by their fellow workers. There are the coke workers, the blast furnace men, the melters, blowers, heaters, rollers, finishers—

FROM AN ORIGINAL DRAWING BY ORISON MACPHERSON

MEN MAKE BATTLE STEELS

workmen of many trades and skills—all doing their part to furnish steel for ships, tanks, guns, planes and other fighting equipment.

These men of steel, by their will-to-do to help win this war, achieve new high records in production night and day, month after month. Every ton of steel they make is shipped to war.

JONES & LAUGHLIN STEEL CORPORATION
PITTSBURGH, PENNSYLVANIA

PARTNER TO INDUSTRY IN WAR PRODUCTION

J&L STEEL

G. W's WEST POINT

Geo. Washington started a World War and learned his military art between his 21st and 26th years, as an officer in four small military expeditions into the Upper Ohio Valley. The task was to oust the French and clear the way for a project of settling English farmers on wilderness lands which he and his Virginia associates of the Ohio Company had obtained by grant from George II.

Washington's first expedition (1753) was to warn French against encroachment on English-claimed territory. He was but 21 when he crossed the Appalachians in dead of winter, with guide, interpreters and pack train. His mission was to uncover just how strong had become French occupation of rich Ohio Valley (present Pittsburgh district). He reported back that French officers "told me it was their absolute design to take possession of the Ohio."

Washington came out again in 1754 in command of small force of militia to chase out French. He got into a fight with them and their Indians. Ensign de Jumonville, young French marine officer of noble descent was killed. Later Washington found himself besieged in temporary stockade (Fort Necessity, in mountains near Uniontown, Pa.). He surrendered July 4. His little force was disarmed, but marched out with drums beating. They straggled back to Virginia, harassed by Indians and pretty well battered up. "The strife that armed all the civilized world began here" (in America) wrote Parkman, and Hugh Walpole said, "It was the volley fired by a young Virginian in the backwoods of America that set the whole world on fire."

These small skirmishes in "the woods and bushes" of the New World (French and Indian War) spread to war in the Old (Seven Years War, 1756-63) during which England wrested from France all of India, of Canada, of America (to the Mississippi) and compelled recognition of British sea supremacy. Washington's next military trips westward were with expeditions related to this early world conflict. He was "guest" aide with ill-starred Braddock (1755) who rejected the young Colonial officer's advice on how to fight Indians. As colonel of a regiment of bucktails (Colonials) he served under victorious General John Forbes (1758).

Washington's last trip to Pittsburgh was made in his 53rd year (1784) to promote a canal connecting the Potomac and Ohio — begun, but never completed. He also looked after his 50,000 acre holdings in Western Pennsylvania, valued at close to half million dollars. Over these now waved the Stars and Stripes of the young Republic his military genius had fathered, and of which he was shortly to be First President. Western Pennsylvania was young George Washington's West Point that fitted him for his career as a soldier and leader of a nation.

They all add up to the one

More steam

HAGAN CONTROL ASSURES –

+ MAXIMUM quantity of steam from any given plant, by introducing fuel and air in correct proportion for utmost efficiency.

+ MAXIMUM utilization value, uniform steam pressure and temperature, in accordance with demand.

+ MAXIMUM output from boilers of differing capacities, automatically.

+ MAXIMUM steam for production, by reducing loss of steam in frequent soot blowing.

+ MAXIMUM PROTECTION of auxiliary equipment, fans, stokers, etc. by maintenance of uniform operating conditions.

= Greater production for war effort

thing you want most...

for the war effort!

NOTHING in steam boiler equipment is more important to the constant carrying of a war load than AUTOMATIC COMBUSTION CONTROL. It must be adequate, reliable, able to take from your shoulders the responsibility for constant attention . . . to give the utmost freedom from manual adjustment. It should be dependable even if you had to go away in an emergency and leave it.

HAGAN AUTOMATIC COMBUSTION CONTROL will give you that kind of service. It will give it under the most trying conditions. It will assure you instant functioning with the slightest changes in steam header pressure. Since it is *air operated,* Hagan Control assures fast, positive action and remarkable freedom from trouble. Hagan Control installations set up years ago are giving the same excellent service they did in the beginning.

Correct engineering on the soundest principles is the reason for Hagan performance – taking infinite pains to assure the greatest design simplicity and the utmost in flexibility to meet varying plant conditions.

You have a right to expect such results from the pioneers who from the beginning have set the pace for this field. If you are not getting such results from the equipment you are now using look into this. Call for a Hagan combustion specialist . . . Now . . . and put an end to your trouble.

SPECIFIC ADVANTAGES OF HAGAN AUTOMATIC COMBUSTION CONTROL

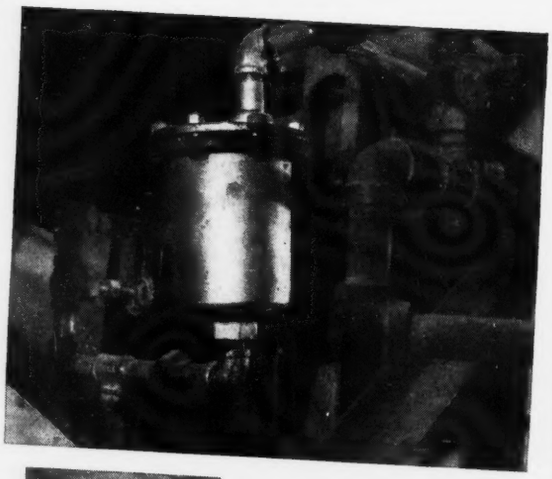
Simplicity of operation.
Ease of installation.
Ruggedness of equipment.
Sensitivity to small load changes.
Accuracy of adjustments for small variations.
Speed of movement, with stability, throughout operating range.
Flexibility in meeting individual plant conditions.
Engineered by the pioneers and leaders in automatic combustion control.

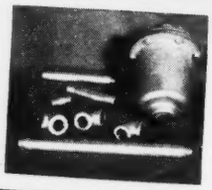
HAGAN CORPORATION · HAGAN BUILDING · PITTSBURGH, PA.

HAGAN *Automatic* COMBUSTION CONTROL
The pioneer . . . and still the leader

Can War Production WAIT on OBSOLETE Steam Trap Piping?

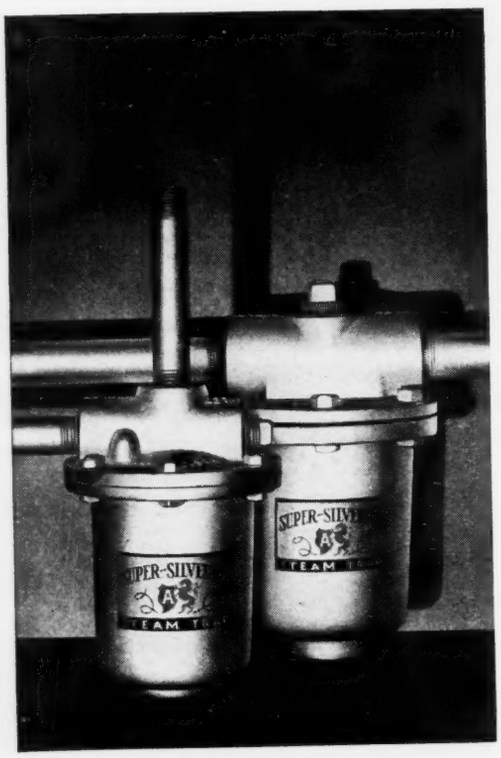
OBSOLETE





From 7 to 13 fittings are generally required for obsolete steam trap piping.

MODERN



● War production cannot be held up for complicated, obsolete steam trap piping. Time is invaluable. Installation of new traps, changes in trap location or trap inspection, must be done in the shortest possible time in order not to tie up steam-using equipment. This means using Anderson Super-Silvertop Steam Traps installed as an elbow or straight-in-line connection, thereby saving from 40 to 60 minutes' time per trap. Besides there's a saving of from 6 to 13 fittings per trap. More than that, Super-Silvertops can be inspected without disturbing pipe connections. In view of these time and material savings, it's only common sense to install Super-Silvertop Steam Traps in either war or peace times. Let us send you a copy of the book, "How To Select A Steam Trap."

THE V. D. ANDERSON CO.
1935 W. 96th Street • Cleveland, Ohio

Super-Silvertop
STEAM TRAPS

Echoes a SHAW Piping Job Done in America

"THREE vital elements essential to the United Nations' successful offensive drive of the war are *Explosives, Synthetic Rubber, 100 Octane Aviation Gasoline.*

"To produce them on *time* in the vast quantities America and our allies need, requires new plants—expansion of old ones—built fast.

"That means undreamed-of demands for all types of piping—piping for processing—piping for power generating stations—piping that has to be bent, flanged, welded and heat-treated . . . then installed. And all done quickly!

"In this big job of piping prefabrication and installation, Shaw Company engineers are directing a vast crew of workers—over 5,000 men, who are helping to speed production of Explosives, Synthetic Rubber and 100 Octane Aviation Gasoline . . . helping to wipe the Japs out of the Pacific and end the world chaos caused by the Nazis.

"We at the Shaw Company are proud of the 24-hour a day, seven day a week war job we have, and we're proud, too, of the Shaw workers, over 90% of whom are buying War Bonds regularly from each pay."

Benj. F. Shaw II
PRESIDENT

BENJAMIN F. SHAW CO.

PIPING FABRICATORS
CONTRACTORS & DISTRIBUTORS

WILMINGTON, DELAWARE

HOW TO MAKE YOUR SPREADER

. . . with less outage and lower maintenance

If yours is one of the many plants operating Spreader stokers, here are some suggestions that will help you get longer life out of your present equipment and minimize outage for repairs or replacements. While they relate primarily to the C-E Spreader Stoker illustrated here, they are largely applicable to all stokers of this general type.

If this information is not of immediate interest to you, please see that it reaches the proper man in your organization.

OPERATION

GENERAL The two main causes of excessive outage and maintenance are (1) sustained or frequent overloading of stoker and (2) operating with insufficient draft resulting in positive furnace pressure.

Where prolonged overloading is unavoidable, as is often the case in these days, good operation and careful attention to maintenance are especially important. Frequently, in such cases, the use of a higher quality coal will make it possible to carry the increased load without excessive outage or maintenance costs.

Where difficulties are due to insufficient draft, the suggestions made under the heading "Draft" may prove helpful.

FIRE (1) Good performance and low maintenance originate primarily in the fuel bed. Keep it level and thin with little more than a minute's supply of coal on the grate. This may be checked easily by shutting off the coal feed with the forced draft on—the fire should be ready to dump in about one minute. A heavy fire will smoke and form clinkers. Clinkers frequently cause burned and broken grate sections.

(2) Adjust distributor speed and circular tray so that coal will feed evenly over the entire grate area. A heavy fire at the bridge wall will not only form clinkers but will cause excessive erosion of brickwork. A heavy fire at the front tends to overheat the arch, piers and distributing mechanism and may injure the stoker front. Always check feeder speed adjustment when character of fuel is changed in type, size or moisture content. Adjust *air supply* to suit every change in *fuel supply*.

(3) Avoid, as far as possible, the use of coal having lumps over 1¼ in. in size; ¾ in. nut and slack is the preferable size. The coarser sizes cause excessive wear on feeder and distributor mechanism and tend to overload and clinker the fuel bed. Under emergency conditions, if difficulty is experienced in getting coal of proper size, it may be necessary to use a screen above the stoker hopper to keep large lumps of coal out of the feeder.

(4) Keep an ample supply of coal in hopper—not less than half full—at all times during operation. *Avoid segregation of coal sizes in hopper.* Wherever possible use mechanically-operated swinging spout, traveling larry or non-segregating spreader chutes.

(5) Clean fires and ash pits at regular intervals, preferably twice each shift. This keeps fires in good condition, ready to handle load swings. Accumulated refuse in ash pit may cause damage to grates and grate mechanism.

(6) When banking a spreader stoker fired unit, be sure to leave a layer of ash on the grate to protect it. Cut down air supply, reduce distributor speed and feed in coal for banking on front end of stoker only. Then cut off forced draft and stoker feed. Maintain slight draft over fire.

DRAFT (1) Draft gage and a CO_2 indicator are essential to good operation.

(2) Operate with a draft above fuel bed—preferably .10 in., not less than .05 in. Plus pressure causes overheating which is destructive to grates, brickwork and possibly to stoker mechanism.

(3) Maintain proper supply of air at all times. Too much or too little air will reduce efficiency and capacity. Insufficient air will cause smoke.

(4) Some air should be allowed to pass through grates at all times except when fire is banked.

(5) Don't force stoker beyond capacity of stack to carry away gases. (See (2) above.)

(6) Keep undergrate zones and side frames sealed to prevent air leakage between zones and into furnace.

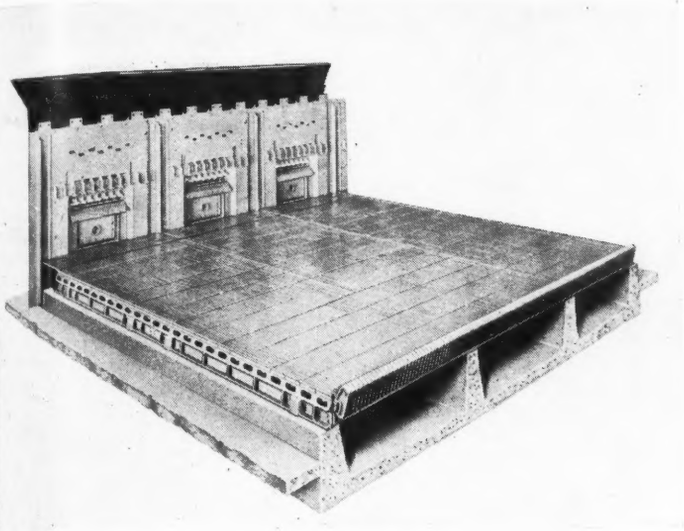
(7) If draft is insufficient, check leaks in setting and losses through boiler and flue connections; check position of boiler damper. Careful checking will usually disclose conditions that can be improved.

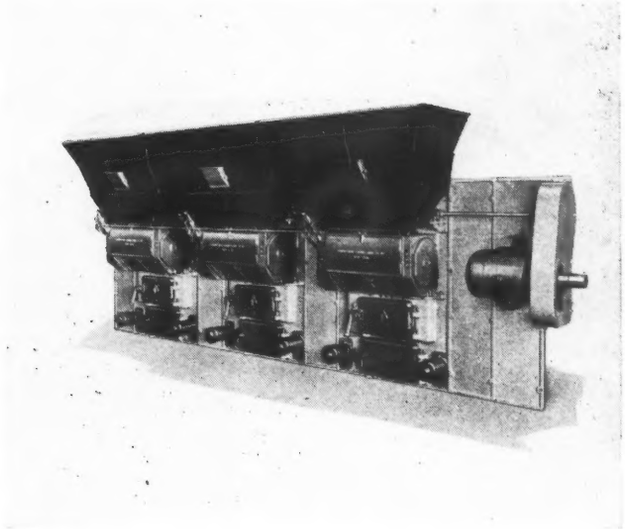
CLEANING (1) Clean equipment lasts longer.

(2) Keep stoker exterior clean to prevent contamination of lubricants and excessive wear of moving parts. Use compressed air or steam hose to remove grease and coal dust—they may catch fire and damage the mechanism.

(3) Check and clean the cinder disposal or recovery equipment regularly. Keep collection hoppers clean to avoid fires.

STOKERS LAST LONGER...





C-E Spreader Stokers, illustrated above, have been applied to all types of boilers ranging in capacity from 4000 to 175,000 lb. of steam per hr.

INSPECTION & MAINTENANCE

(1) Inspect all accessible parts of stoker daily, and examine stoker completely when shut down—at least twice yearly.

(2) Replace broken grate sections promptly to prevent excessive sifting loss. Allow clearance between grate elements when assembling to avoid damage due to their natural growth under heat.

(3) Inspect mechanism occasionally for wear on gears, condition of bearings, alignment and lubrication. Tighten loose nuts.

(4) Keep belts, pulleys, chains and sprockets lined up and adjusted to proper tension. A slack chain will whip and wear excessively. A loose belt will slip and overheat. Chains and belts that are too tight cause excessive wear on shafts and bearings. Keep chains clean and well lubricated. Keep belts clean and free of oil or grease.

(5) Use only recommended shear key. The substitution of other material may result in overloading or breakage of stoker mechanism.

LUBRICATION

Lubricate all points requiring lubrication on a definite schedule. Use the correct grade of lubricants. Give particular attention to the drive mechanism. Flush and clean gear case at least once a year. Refill to correct level with new oil of proper grade. Adequate lubrication is inexpensive insurance against outage and excessive maintenance.

The C-E line of stokers is the most extensive on the market. It includes single retort, multiple retort, spreader, traveling and chain grate types.

OVER 17,000 C-E STOKERS HAVE BEEN PURCHASED TO DATE

Reprints of this advertisement available on request.

A-691

COMBUSTION ENGINEERING

COMPANY, INC. • 200 MADISON AVENUE • NEW YORK, N.Y.

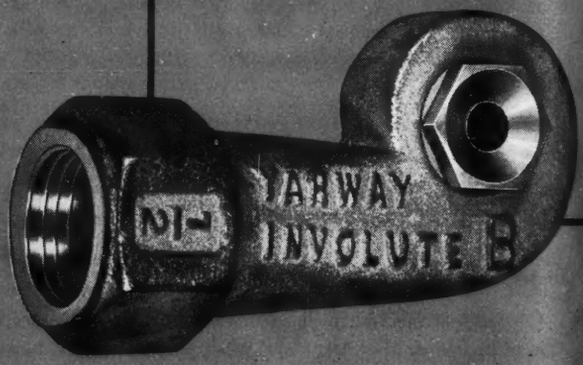
THERE'S

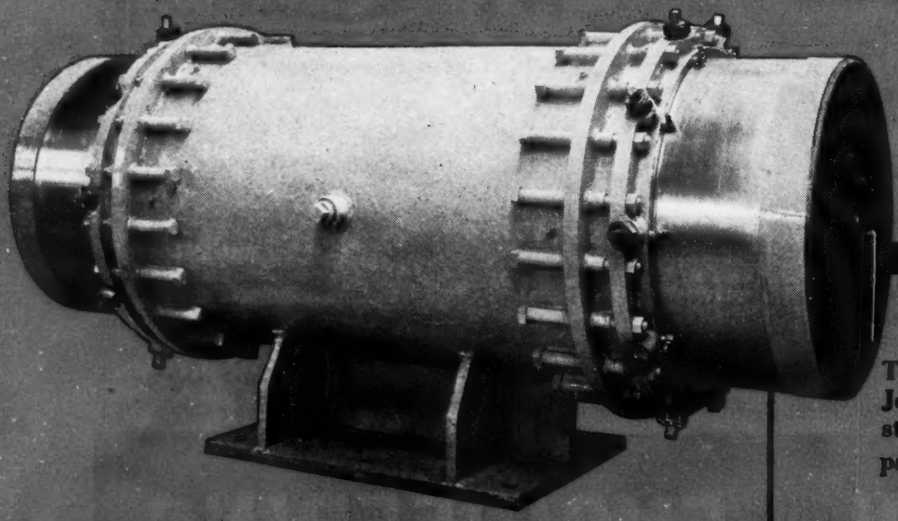
"IMPULSE"

The Yarway Impulse Steam Trap has only one moving part; no buckets, bellows, levers or floats. Bulletin T-1737.

"INVOLUTE"

The Yarway Involute Spray Nozzle is non-clogging, trouble-free. No internal parts; contour of body guides flow in an involute path. For cooling condenser water and for air conditioning service. Bulletin N-616.





"GUN-PAKT"

The Yarway Gun-Pakt Expansion Joint may be re-packed under full steam pressure and never needs unpacking. Bulletin EJ-1908.

YARWAY

A Reason..

ALL these Yarway Steam Specialties have become outstanding successes because of unique Yarway engineering principles. That's why so many plant operators say, "Yarway is our way" when selecting such equipment.

YARNALL-WARING COMPANY
100 Mermaid Ave. Phila.

"FLOATLESS"

The Yarway Floatless Water Column operates with balanced solid weights, on the well-known displacement principle. Bulletin WG-1808.

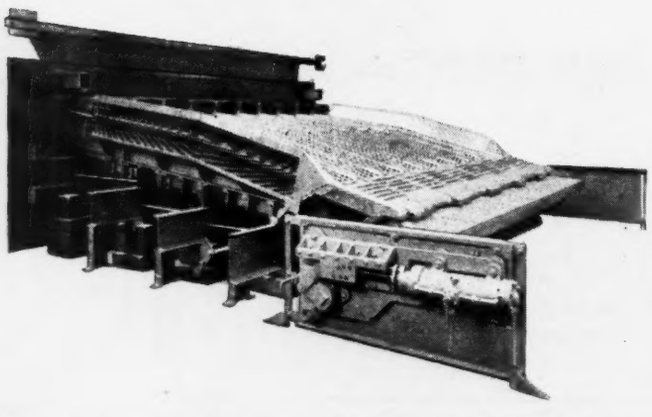
"SEATLESS"

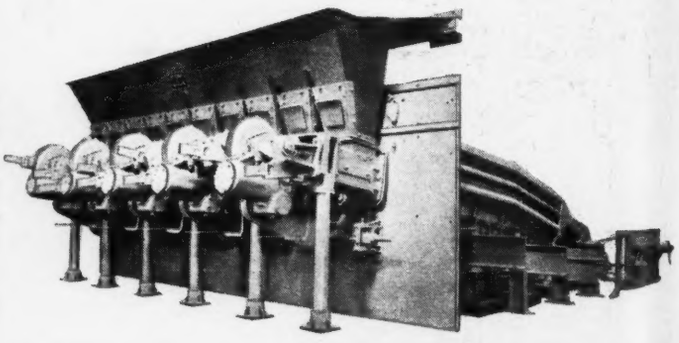
The Yarway Seatless Blow-Off Valve has no seat to score, wear and clog with mud, scale and dirt. Bulletin for high pressures B-431; for low pressures B-420.

STEAM SPECIALTIES

★ ★ ★ STABILITY AND

DETROIT MULTIPLE (Ten) RETORT, INCLINED STOKER in a Public Utility Plant, designed to generate 90,000 pounds of steam per hour with Ohio Coal of 11,700 B. T. U.'s.





DETROIT STOKER COMPANY

Sales and Engineering Offices, General Motors Bldg., Detroit • Main Office and Works, Monroe, Mich.

EFFICIENCY ARE IN-BUILT

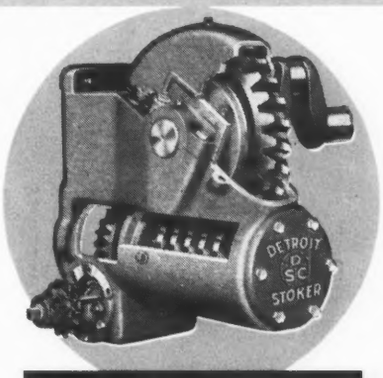
Investigate the outstanding Features:

- *Large square rams operate in ram cases with adjustable liners.*
- *Inclined retorts of decreasing depth with moving bottom plates.*
- *Coal feed adjustments with shearing pins separately for each retort.*
- *Extension moving rear grates.*
- *Dumping grates, simple operating mechanism, (Power or Manual) are accessibly located.*
- *High and low pressure air zones, with proper distribution.*

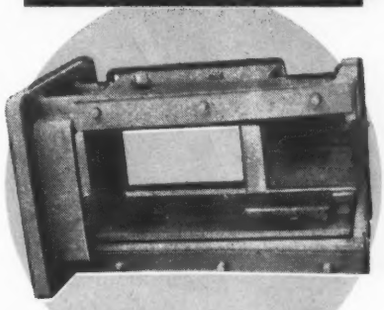
Ability of a Stoker to "take it" month in and month out without trouble—calls for *sound design* and *best construction.* Detroit Multiple Retort Stokers have this *Stability*—they are *Heavily Built* to withstand continual hard service.

Noted for high operating efficiency—here is typical performance:

Coals	B. T. U.'s Per Pound	Combined Efficiency of Boiler and Furnace
Kentucky	13,200	85.6%
Virginia	14,000	83.2%
Indiana	11,000	76.2%
Pennsylvania	13,900	80.5%
West Virginia	14,000	80.7%

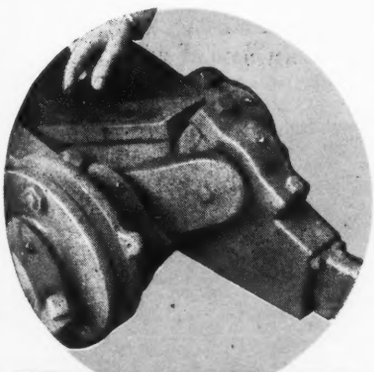


MECHANICAL DRIVES—Machine cut worms and gears—tapered roller bearings—run in oil—dependable—require little power for operation.

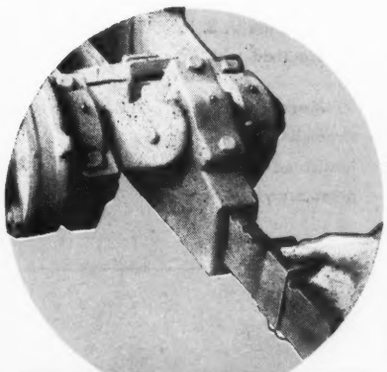


RAM CASES—Renewable and adjustable liners assure correct fit of the coal plungers.

PLATE TUYERES—Are of high heat resisting iron, easily renewed.



COAL DISTRIBUTION CONTROL—Moving retort bottoms control coal distribution—separately adjusted for each retort.



COAL FEED ADJUSTMENT—Readily made. Independent for each retort.

MULTIPLE RETORT STOKERS

DETROIT

Fuel Conservation *Begins right here*

THEY PREFER TEXACO

★ More locomotives and cars in the U. S. are lubricated with Texaco than with any other brand.

★ More revenue airline miles in the U. S. are flown with Texaco than with any other brand.

★ More buses, more bus lines and more bus-miles are lubricated with Texaco than with any other brand.

★ More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.

★ More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.

TEXACO

TEXACO

HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY

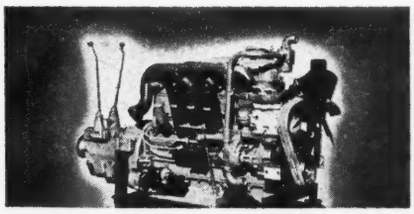
TODAY when "more power from less fuel" is a National necessity, every Diesel operator can assist by lubricating with *Texaco Algol* or *Ursa Oils.*

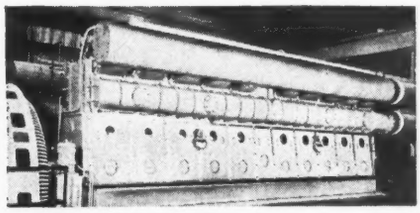
Resisting the formation of gum, sludge and hard carbon, *Algol* and *Ursa Oils* keep compression rings free in their grooves, oil rings clear, maintaining that piston seal which means full power and maximum fuel economy. They keep valves clean, ports open . . . greatly extend periods between inspections and overhauls.

Because of the benefits Texaco brings—*More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.*

The outstanding performance that has made Texaco FIRST in the stationary Diesel field has made it FIRST in the fields listed in the panel.

These Texaco users enjoy many benefits that can also be yours. A Texaco Lubrication Engineer will gladly cooperate . . . just phone the nearest of more than 2300 Texaco distributing points in the 48 States, or write The Texas Company, 135 East 42nd Street, New York, N. Y.





From big stationary Diesels to small, high-speed units, engines are kept CLEAN . . . often 3 times cleaner than with ordinary oils . . . when lubricated with specialized *Texaco Diesel Lubricants.*

Lubricants and Fuels

FOR ALL DIESEL ENGINES

TUNE IN FRED ALLEN EVERY SUNDAY NIGHT—CBS

...for clean Boilers

SODA ACID PHOSPHATE

or

PROTEIN ACID PHOSPHATE

What to do about that scale problem—yes, we know you have had advice before, good and bad. And probably, today you still face the same old problem with your fingers crossed.

SHALL IT BE SODA ACID PHOSPHATE OR PROTEIN ACID PHOSPHATE . . . . . ?

CYRUS W. RICE & CO., INC.

MAKE YOUR DECISION TODAY

The founder of this company, after thirty-five years in experimental research and development work on this ages-old problem, admits today that the crowning achievement of this Era came 7 years ago when the Rice Laboratories announced the birth of PHOSCALOID, a Protein Acid Phosphate—as opposed to the common use, then, of Soda Acid Phosphate.

Naturally, it reacts differently, being a highly concentrated liquid with P_2O_5 including 13% selected Colloids, and furthermore it requires an average of 25% less PHOSCALOID to do the job, due to the reaction effects of its content of proteins or calcium.

Following its use, periods between boiler cleanings have in some cases been extended from 2 months to 2 years.

As an after treatment for lime-soda softening plants, the *protein* content of this same colloid has not only proven the effectiveness of PHOSCALOID but on the average has cut the cost to approximately 50% over other treatments.

The Rice Laboratories know the advantages of Protein Acid Phosphates for your feed water problem. So do the hundreds of Engineers who have gone over to PHOSCALOID since its inception 7 years ago. We recommend it to you. Those engineers will recommend it, to you.

THE COUPON

will bring a booklet covering the history of feed water treatment development from the early days —also the story of the development of this better, quicker and more economical solution to *your* feed water problem. Write for a copy.

CYRUS W. RICE & COMPANY, INC.—PITTSBURGH, PA.

You may send me a copy of "Silica vs. Phoscaloid"—the Story of Phoscaloid's Development.

NAME

COMPANY

ADDRESS

CITY

STATE

Pittsburgh, Pa.

UP AGAINST STACK DISCHARGE?
THEN YOU NEED A-E-CO TAYLOR STOKERS

A CASE IN THE HEATING PLANT FIELD

PROBLEM:

The first and foremost problem when this plant was engineered in 1929 was stack discharge. Located in the heart of a fine residential district, it was imperative that no objectionable smoke or cinders be produced.

SOLUTION:

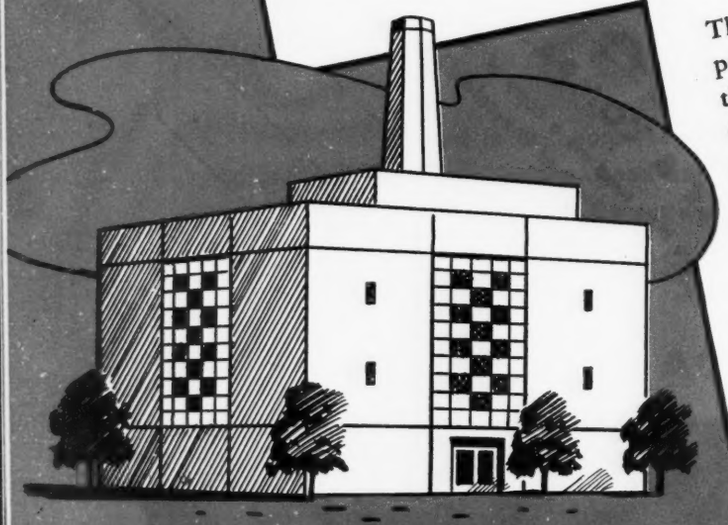
Two Taylor Stokers were finally chosen for this plant, each operating under 550 H.P. boilers—refractory furnace construction throughout and no heat recovery equipment. As an added precaution, because of the delicate public relations problem, the boilers were equipped with cinder-collecting type induced draft fans.

RESULTS:

The Taylor Stokers proved more than a match for the problem. Not only was stack discharge held to an unobjectionable minimum but high efficiency and low maintenance were achieved, burning low grades of Ohio Coal with an average heating value of 12,275 B. T. U. as fired. From the fall of 1939 to spring 1942, 330,334,000 lbs. of steam were generated, burning 34,772,000 lbs. of coal. Average actual evaporation 9.5 lbs. steam per pound coal. Steam pressure 125 lbs. G., moisture in steam 1%, feed temp. to boiler 212°F. Steaming range 25% to 168% of boiler rating. Combined efficiency 77.7%. Material maintenance 2¢ per ton coal as fired since 1929!

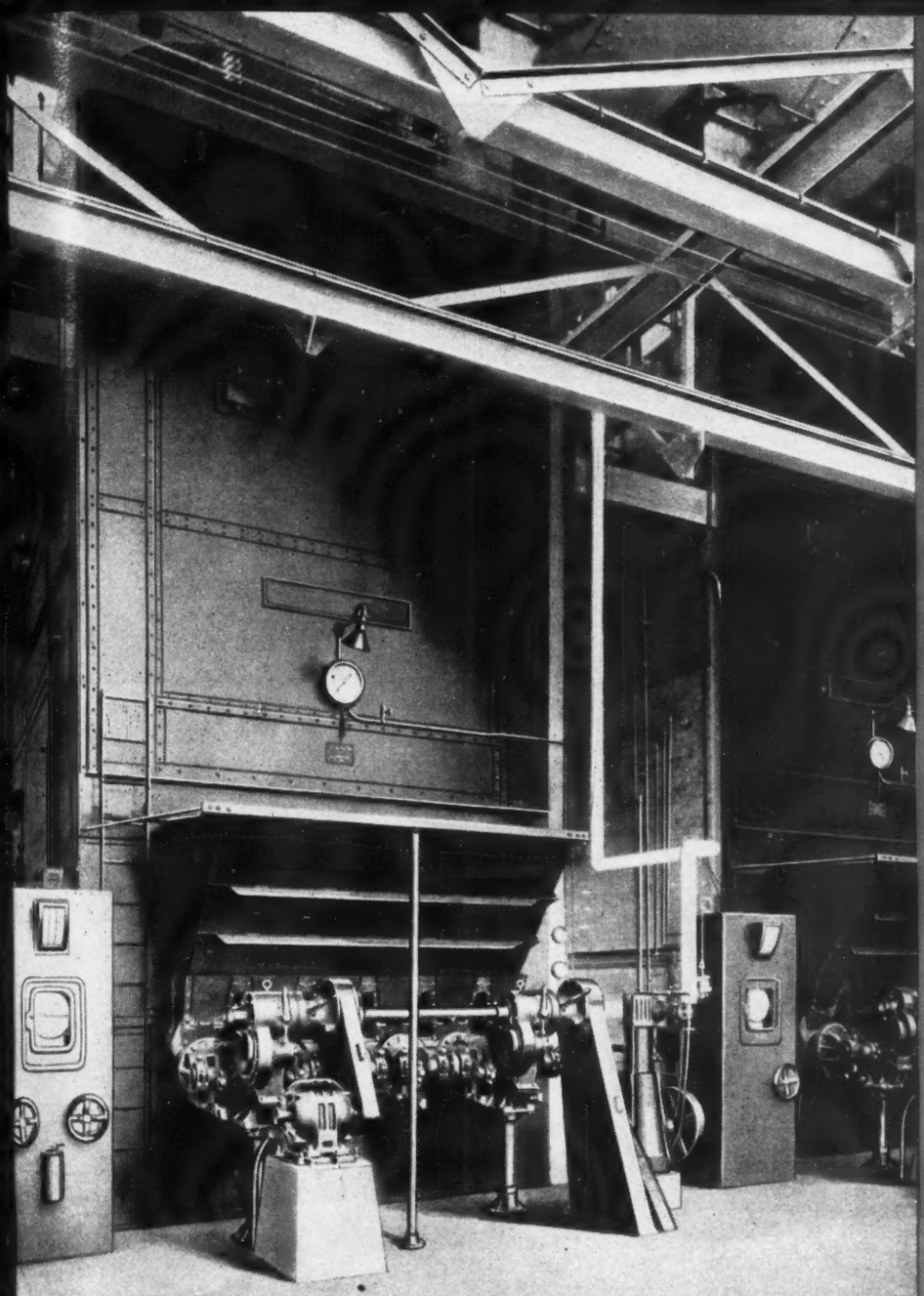
CONCLUSIONS:

This case is an outstanding example of the manner in which Taylor Stokers, selected for one prime purpose, deliver *extra* advantages. In this case, although minimum stack discharge was the primary requirement, high efficiency and low maintenance were also achieved. Although cinder-collecting fans were used because of the abnormal demands for minimum discharge, ordinarily these are not required with Taylor Stokers.



AMERICAN ENGINEERING

PHILADELPHIA • PENNSYLVANIA



A-E-CO TAYLOR STOKERS ON THE FIRING LINE

*Aluminum Company of America, Edgewater, N. J.
*Aluminum Company of America, New Kensington, Pa.
American Tobacco Co., Inc., Durham, N. C.
Castanea Paper Company, Johnsonburg, Penna.
Chrysler Corporation, DeSoto Plant, Detroit, Mich.
*Collins and Aikman Corp., Roxboro, N. C.
City of Columbus, Ohio
*Consolidated Paper Company, Monroe, Michigan
*Cresson State Sanitarium, Cresson, Penna.
Defiance Milk Products Co., Defiance, Ohio
*DeLaval Steam Turbine Co., Trenton, N. J.
*Detroit Sulphite Pulp & Paper Co., Detroit, Michigan
City of Dover, Ohio
*Draper Corporation, Hopedale, Mass.
Erwin Cotton Mills Co., West Durham, N. C.
*Fisher Body Corporation, Detroit, Michigan
Fisher Body Corporation, Fleetwood Plant, Michigan
*Fisher Body Corporation, Grand Rapids, Michigan
*Fisher Body Corporation, Pontiac, Michigan
Fox Paper Company, Lockland, Ohio
Froedtert Grain and Malting Co., Milwaukee, Wisc.
*City of Galion, Ohio
*Gardner-Richardson Company, Lockland, Ohio
*General Electric Company, Erie, Penna.
*General Electric Company, Fort Wayne, Ind.
*Greenwood Electric L. & W. Plant, Greenwood, Miss.
*Board Public Works, Hannibal, Mo.
Hill School, Pottstown, Penna.
*Hobart Mfg. Co., Troy, Ohio
*City of Holland, Michigan
*Hope Natural Gas Co., Cornwell Station, West Va.
Hudepohl Brewing Co., Cincinnati, Ohio
Industrial Cotton Mills, Rock Hill, S. C.
*City Water & Light Plant, Jonesboro, Ark.
Kohler Company, Kohler, Wisc.
Maryland State Penal Farm, Roxbury, Md.
*Marbury Sanitarium, Northville, Michigan
Michigan Carton Company, Battle Creek, Michigan
*Michigan State College, East Lansing, Mich.
Municipal Light Plant, Marshfield, Wisc.
*Pacific Mills, Lyman, S. C.
*Packard Motor Car Co., Detroit, Michigan
*Municipal Electric Plant, Painesville, Ohio
*Park Drop Forge, Cleveland, Ohio
*Pennsylvania Electric Co., Seward, Penna.
*Pennsylvania R. R. Co., Philadelphia, Penna.
*Picatinny Arsenal, Dover, N. J.
*Pittsburgh Plate Glass Co., Barberton, Ohio
Borough of Quakertown, Quakertown, Penna.
Raleigh Wyoming Mining Co., Glen Rogers, W. Va.
*Rhinelander Paper Company, Rhinelander, Wisc.
City of Richland Center, Wisconsin
*City of Richmond, Indiana
Sayles Biltmore Bleachery, Biltmore, N. C.
Scotten Dillon Company, Detroit, Michigan
Shelby Cotton Mills, Shelby, N. C.
Sloane-Blabon Corp., Philadelphia, Penna.
*Solvay Process Company, Detroit, Michigan
*St. Elizabeth's Hospital, Washington, D. C.
City of St. Bernard, Ohio
Swarthmore College, Swarthmore, Penna.
*Timken Roller Bearing Co., Canton, Ohio
Timken Roller Bearing Co., Gambrinus, Ohio
Municipal Water & Light Plant, Tippecanoe City, O.
City of Toledo, Ohio
*Union Bleachery, Greenville, S. C.
Union Mills Paper Mfg. Co., New Hope, Penna.
*University of Wisconsin, Madison, Wisc.
*Vassar College, Poughkeepsie, New York
*Borough of Vineland, New Jersey
Warfield Natural Gas Company, Harold, Kentucky
White Sewing Machine Co., Cleveland, Ohio
Whiting Plover Paper Company, Stevens Point, Wisc.

(*) *Represents repeat orders.*

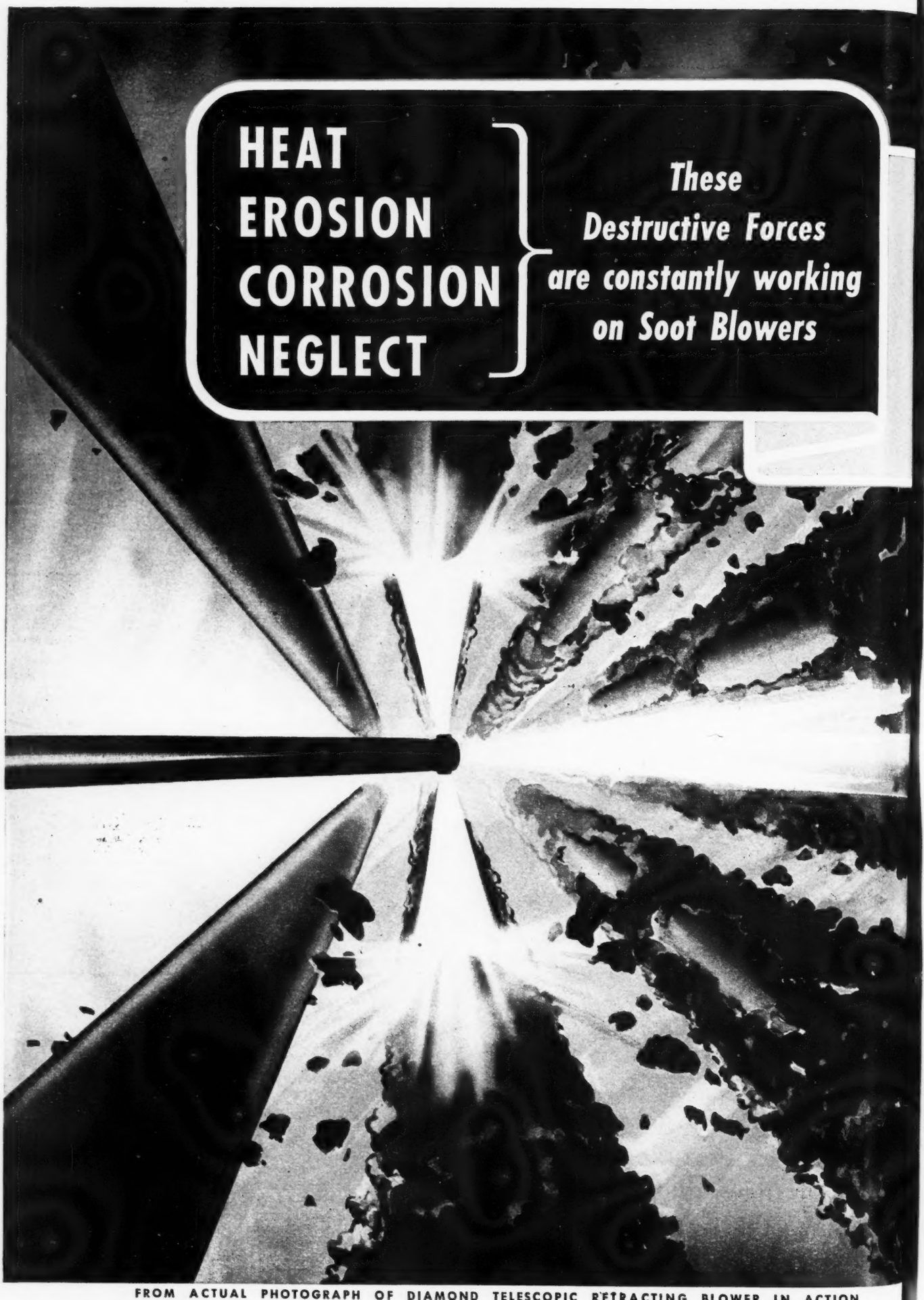
A-E-CO TAYLOR STOKER

A-E-CO TAYLOR STOKERS
WATER WALLS · ASH HOPPERS
HELE-SHAW FLUID POWER
MARINE DECK AUXILIARIES
LO-HED HOISTS

COMPANY

BEFORE YOU BUY ANY FUEL FIRING EQUIPMENT CONSIDER EACH OF THESE 12 FACTORS

1. **RELIABILITY**—the ability to operate with minimum outage and minimum standby equipment.
2. **CAPACITY**—the ability to provide adequate prime capacity ratings, with sufficient reserve capacity for emergencies.
3. **MAINTENANCE**—the ability to operate continuously with minimum repair costs.
4. **FLEXIBILITY**—the ability to follow the steam demand upward or downward . . . quickly and without sacrificing efficiency.
5. **EFFICIENCY**—the proved dollar efficiency (total cost of steam production) as shown by actual performance in similar installations.
6. **OPERATION**—the ability to operate continuously, the number and type of operations required, the ease of combustion adjustments, etc.
7. **ADAPTABILITY**—the ability to meet special and limiting conditions, present and future—structural limitations, utilization of present equipment, growth and change of power service demands.
8. **FUEL FLEXIBILITY**—the ability to burn efficiently and easily fuels from many sources having widely varying characteristics.
9. **REFUSE DISPOSAL**—the ability to economically eliminate ash or refuse and the opportunities of disposal at low cost, no cost, or profit.
10. **STACK DISCHARGE**—the practical elimination of "smoke nuisance" without special equipment.
11. **SPACE REQUIREMENTS**—the ability to conform to existing or future space limitations, to short and wide or long and narrow furnaces. Also the accessibility of component parts for maintenance and operation.
12. **OBSOLESCENCE**—the adaptability of the equipment toward possible future modernization with minimum of complication and outage.



FROM ACTUAL PHOTOGRAPH OF DIAMOND TELESCOPIC RETRACTING BLOWER IN ACTION

That's why you need the
BEST SOOT BLOWERS MONEY CAN BUY!

No other equipment in the power plant has so much demanded of it as have the soot blowers. Soot blowers receive less attention than anything else—must meet conditions of heart-breaking severity—rarely get even so much as a drop of oil. Heat, erosion, corrosion, neglect—all these destructive forces are at them continually.

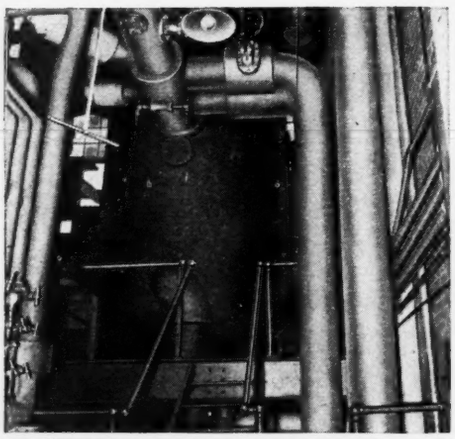
Yet, soot blowers are expected to do their work—instantly—efficiently—any time—month after month and year after year. Their installed cost is only a minor portion of the cost of any power plant, so—

Certainly the very best you can get is none too good for such an assignment. The great majority of power engineers have found that the extra values of Diamond Soot Blowers are worth far more than their slight additional cost.

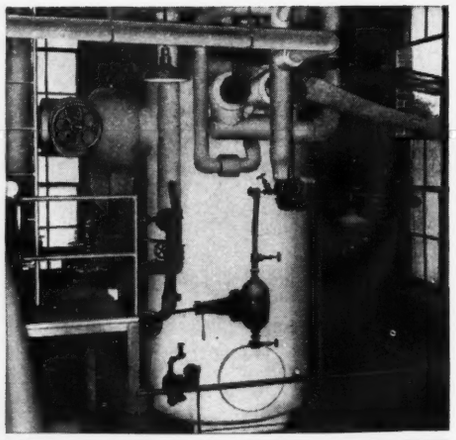
Diamond Soot Blowers are Used in More Than 80% of All Modern Power Boilers

THROW YOUR *Scrap* INTO THE FIGHT

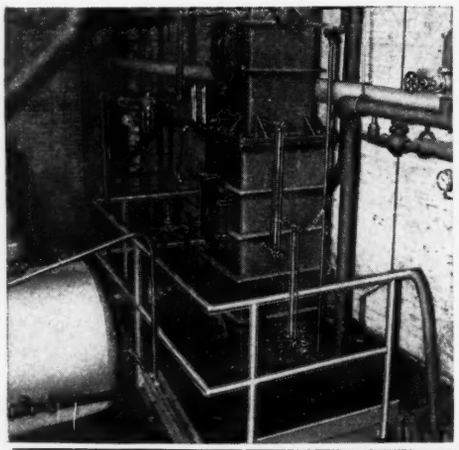
DIAMOND POWER SPECIALTY CORP., Detroit, Michigan
DIAMOND SPECIALTY, LIMITED, Windsor, Ontario



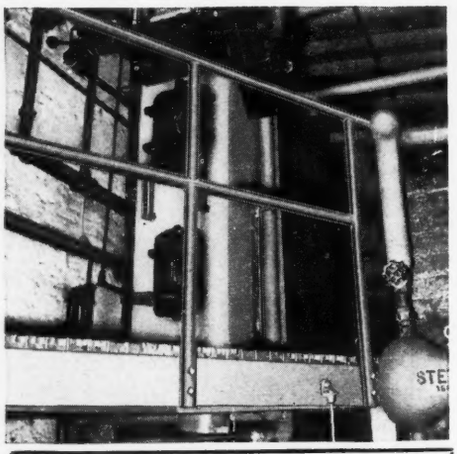
COCHRANE 300,000 LBS/HR DEAERATOR.



COCHRANE 120,000 LBS/HR DEAERATOR.



COCHRANE 20,000 LBS/HR DEAERATOR.



COCHRANE 9,000 LBS/HR DEAERATOR.

ONE OF THE LARGEST TEXTILE MILLS IN THE SOUTH

has installed Cochrane Deaerators in all of its plants in capacities ranging from 9,000 lbs/hr to 300,000 lbs/hr. The removal of oxygen and other dissolved gases and the complete heating of the boiler feedwater have aided considerably in the efficient operation of the boiler plants in these famous mills.

Power Plants from the smallest industrial to the largest central station are equipped with Cochrane Deaerators designed for their specific needs.

COCHRANE CORPORATION • 3106 N. 17th ST. • PHILADELPHIA, PA.

COCHRANE

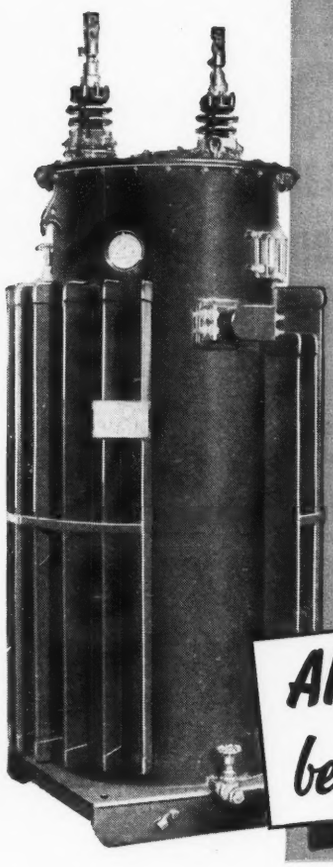
SOFTENERS • DEAERATING SOFTENERS • DEAERATORS • METERS • STEAM SPECIALTIES

Here's the TRANSFORMER *that* STANDS UP BEST *under*

Voltage Surges
Emergency Overloads
Dust and Dirt

Because it's a liquid-filled transformer . . .

AND it's free of fire hazard because the liquid is PYRANOL



333-kva Pyranol* transformer, rated 60 cycles, 2400/4160 Y volts to 240/480 volts

PYRANOL transformers have all the features that have made liquid-cooled transformers the most nearly trouble-free electric apparatus in service today. For example:

They have high dielectric strength both at normal frequencies and impulse—an important safeguard against damage to the transformers from voltage surges caused by switching operations or by lightning. Immersion of the transformer interior in the Pyranol prevents drying and cracking of the winding insulation, a feature vital to maintenance of the high dielectric strength originally built into the transformer.

The heat-storage capacity inherent in liquid-filled transformers makes Pyranol units ideal for emergency overloads.

The pressure-tight tank protects vital parts of the transformers against damage from moisture, dust, dirt, and sabotage.

Additional Benefits

1. Saving in Copper. Secondary conductors (480 volts) require about 15 times as much copper as equivalent lengths of 4160-volt primary conductors. In a typical, large industrial plant, installation of Pyranol transformers indoors at load centers can save 50 per cent or more on copper—30,000 pounds or more.

2. Saving in Installation Cost. Because Pyranol made possible a vaultless installation of several small transformers indoors (instead of one large transformer outdoors), it brought over-all savings of approximately 20 per cent in the installed cost of a plant distribution system.

3. Saving in Power. Pyranol transformers at load centers reduce copper losses as much as 25 per cent.

Ask your G-E representative for complete information, or write for Bulletin GEA-2048D. *General Electric, Schenectady, N. Y.*

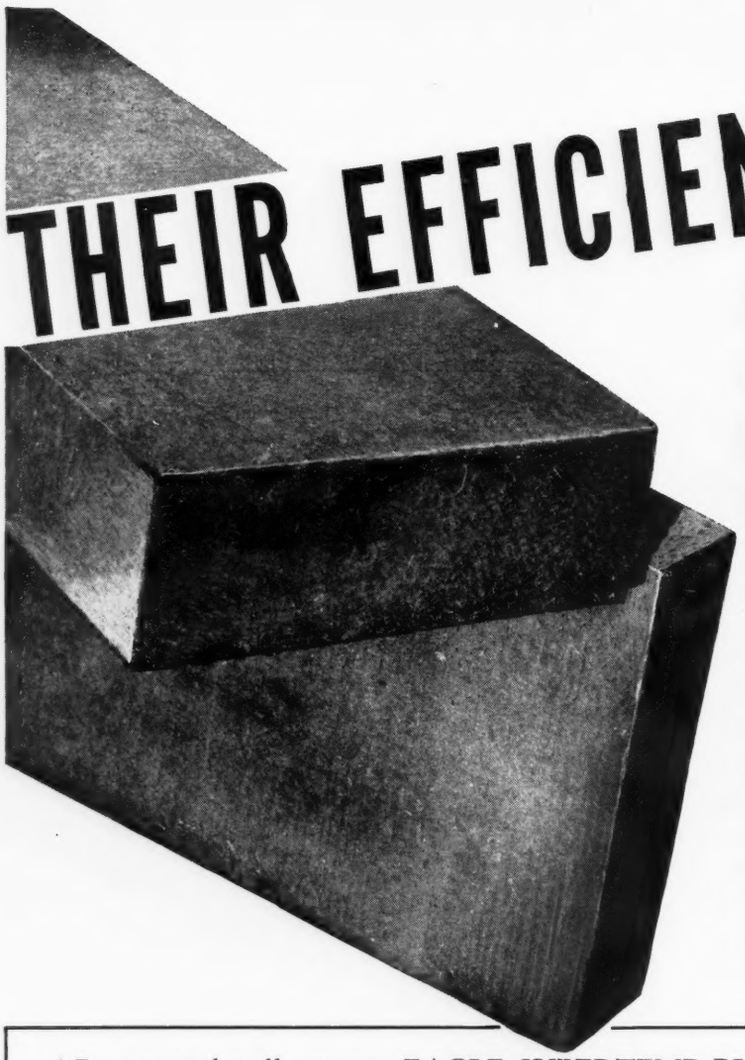
**Pyranol is the G-E trade name for askarel. Pyranol is noninflammable, and no Pyranol transformer has ever burned or contributed to a fire.*

The Navy "E", for Excellence, has been awarded to 92,780 General Electric employees in six plants manufacturing naval equipment.

GENERAL ELECTRIC

402-52-5100

THEIR EFFICIENCY LASTS!



Eagle Supertemp Blocks are made of mineral wool . . . Reports show full efficiency for temperatures to 1700° F.

Economy-minded power plants have needed an insulation like this for years!

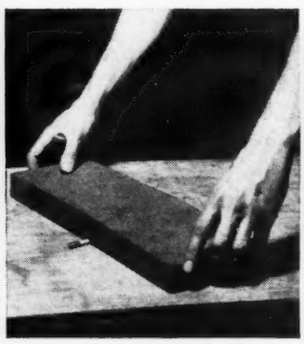
Eagle Supertemp Blocks are efficient for a full range of temperatures. They're fabricated of Eagle Mineral Wool — a lightweight material with the "dead air cell structure" so essential to high effectiveness — a material that is both chemically and physically stable.

Actual experience on hundreds of installations proves that Eagle Supertemp Blocks are readily installed — and in addition to their very low thermal conductivity are strong and tough enough to withstand all normal handling and usage. Their lasting efficiency assures remarkable fuel savings for temperatures as high as 1700° F.

Write today for free catalog sheets.

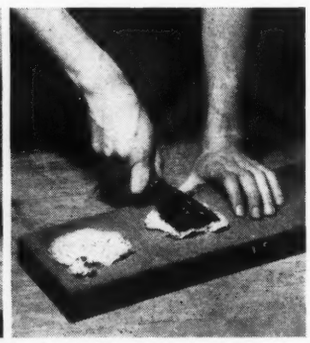
4 Reasons why all-purpose EAGLE SUPERTEMP BLOCKS are cutting insulating costs . . .

1. ***They cut like cheese.*** A sharp knife or saw quickly slices Eagle Supertemp Blocks. They're easily cut on the job to fit all ordinary or odd-shaped surfaces.



2. ***Sufficiently flexible.*** Pencil test demonstrates how Eagle Supertemp Blocks conform to ordinary curved surfaces. Have great breaking strength.

3. ***Snug fit.*** The underneath side of Eagle Supertemp Blocks is compressible. It's easy to fit blocks over projecting rivet heads and other surface irregularities.



4. ***Easily installed.*** Eagle Insulstic speeds application of Eagle Supertemp Blocks. This fibrous plastic binds blocks until permanent support is completed.

Eagle-Picher High Temperature Insulations

Eagle Super "66" Plastic Insulation
Eagle Supertemp Blocks
Eagle L-T Felts
Eagle Blankets

EAGLE EP PICHER

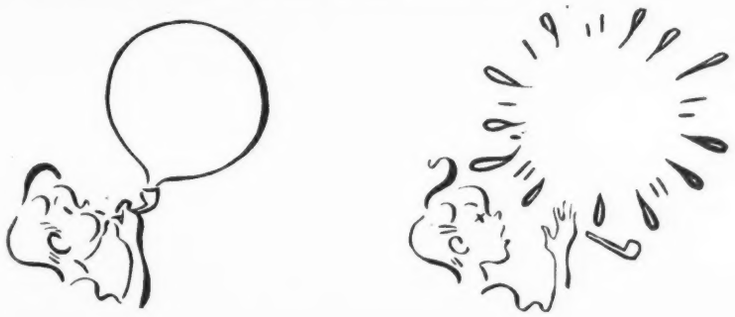
Eagle Finishing Cements
Eagle Loose Wool
Eagle Insulseal
Eagle Insul-stic

THE EAGLE-PICHER LEAD COMPANY · CINCINNATI, OHIO

Among the Big Guns OF THIS WAR is the Grease Gun!

EVERY LUBRICATION JOB should be a bullseye today — enough lubricant, not too much. With anti-friction bearings, remember grease guards the steel rolling elements primarily against *corrosion,* not friction. Too much grease only *promotes* heat!

AS LONG AS oil prevents metal-to-metal contact in sleeve bearings, wear is impossible — *if no grit is present!* Thus it pays to keep oil covers tight, dust seals in good condition.

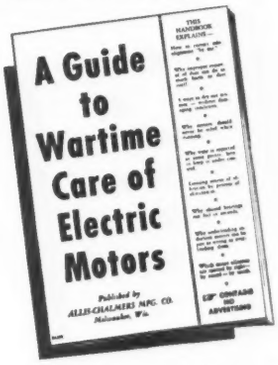


AN OIL FILM often is no thicker than the wall of a soap bubble — can fail just as suddenly *and completely.* To protect it, maintenance guards against pressures from misalignment.

MAINTENANCE IS IN THIS WAR WITH EVERYTHING IT'S GOT — AND THAT'S *PLENTY!* FOR EXAMPLE — HERE ARE WAYS PROPER CARE OF MOTORS HELPS INSURE FULL — *AND CONTINUED* — U. S. PRODUCTION!

FINER lubrication than ever is vital today — but it's only *one* method used by maintenance to step up the wartime efficiency of motors.

Fighting dust, moisture and stray oil is important, too — and all such means of safeguarding motors are presented in Allis-Chalmers' new maintenance handbook . . .



"A Guide to Wartime Care of Electric Motors" describes all nine main motor enemies in detail — tells how to fight each of them.

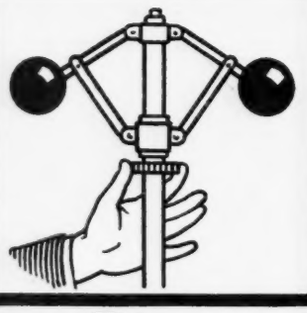
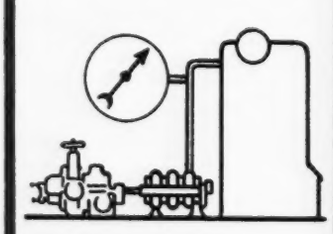
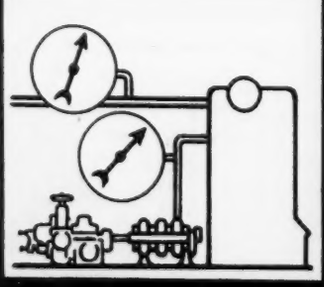
It's fully illustrated — applies to *all* standard makes of general-purpose motors — contains no advertising. Write now for *your* free copy. ALLIS-CHALMERS MFG. CO., MILWAUKEE.

A-552

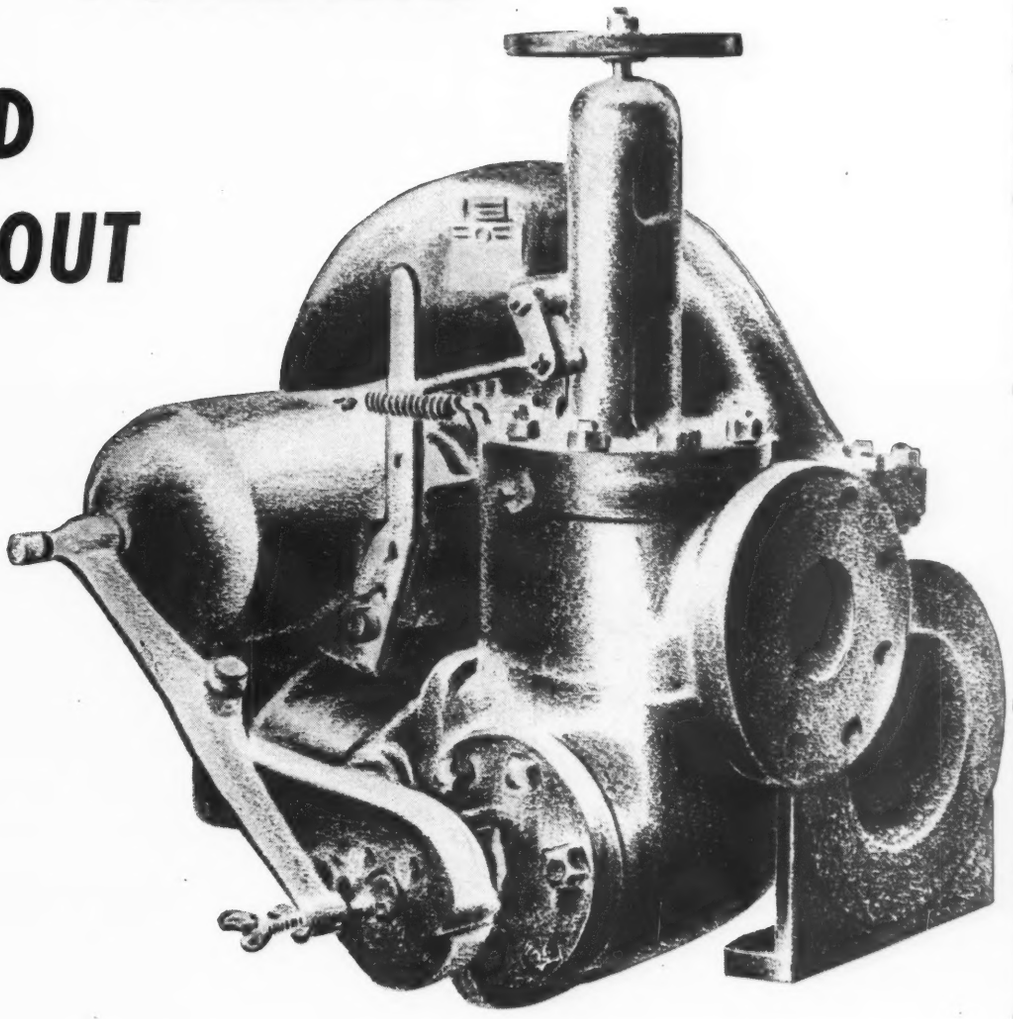
ALLIS-CHALMERS

WE WORK FOR VICTORY WE PLAN FOR PEACE

If it's ADJUSTABLE SPEED CONTROL *you want* ...

GENERAL ELECTRIC TURBINE GOVERNORS		SPEED ADJUSTMENT	REGULATION NO LOAD TO FULL LOAD	
CENTRIFUGAL-WEIGHT GOVERNOR		0	6%	With this type, the turbine speed is controlled by a horizontal, centrifugal-weight governor mounted on the end of the rotor shaft and connected through a linkage to the double-seated governor valve. In response to changes in speed, the weights travel in or out to open or close the valve. Knife edges and contact surfaces in this mechanism are hardened to reduce wear and minimize friction.
CENTRIFUGAL-WEIGHT GOVERNOR WITH HAND SPEED CHANGER		−10% +10%	6%	A hand speed changer can be built into the linkage of the centrifugal-weight governor described above. This varies the effective length of the valve stem to provide speed range by manual adjustment. It is always required on dual-drive applications to equalize the turbine speed with the motor speed.
DIRECT-ACTING OIL GOVERNOR		−66%	8 TO 20%	A shaft-driven, gear-type pump supplies oil direct for governing. Regulation is 8 per cent at maximum speed and 20 per cent at reduced speed.
OIL-RELAYED GOVERNOR		−10% +10%	4%	Where large valves must be controlled or where speeds are above 5000 rpm, oil-relayed governors are recommended for closer, more accurate speed control. The governor itself operates only a small pilot valve which relays the action of the governor to the governor valve. The governor acts as an indicator of the speed and supplies the small force necessary for operation of the pilot valve.
CONSTANT-PRESSURE REGULATOR		AUTOMATIC AS REQUIRED		Pump discharge pressure is piped to the diaphragm of a pressure regulator which directly regulates the governor valve on the turbine. The speed of the turbine is automatically adjusted to obtain a constant discharge pressure from the pump.
DIFFERENTIAL-PRESSURE REGULATOR		AUTOMATIC AS REQUIRED		This pressure regulator is equipped with two diaphragms—one piped to the pump discharge and the other to the boiler. The governor valve is controlled in terms of the difference in pressure on the two diaphragms. The differential-pressure regulator automatically adjusts the turbine speed to maintain pump pressure at a predetermined value above the boiler pressure.

...Here's the TURBINE YOU SHOULD KNOW ABOUT



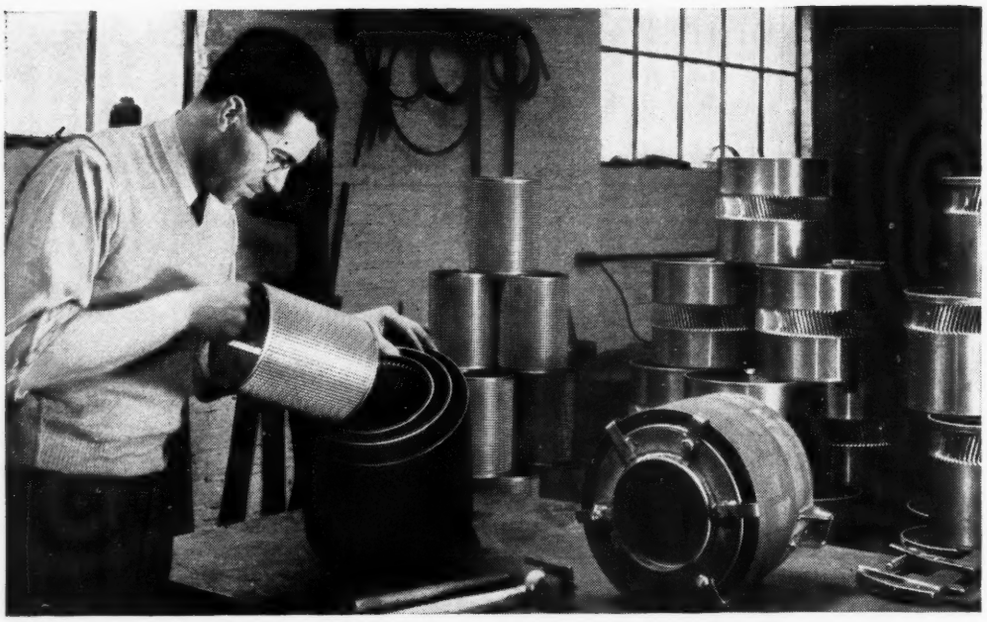
NO one—industrial or utility—who is increasing capacity can afford to overlook the adaptability of mechanical-drive turbines to a wide range of speeds. Because turbines can always operate at the *right* speed, plant efficiency goes up, and drive costs go down. A turn of the hand speed changer sets the "ideal" speed; or, sensitive diaphragms automatically control discharge pressure on pumps and fans over the entire range of variations in steam pressure.

Every Type D mechanical-drive turbine is equipped with two types of governors—overspeed and operating—that function separately and independently. When speed becomes excessive, a through-bolt, spring-loaded, unbalanced weight strikes a trip device to instantly close a built-in combined trip and throttle valve. During normal operation the turbine speed is controlled by the operating governor, which makes use of a small variation in the speed being controlled or of a change in the controlled pressure acting on a diaphragm. G-E speed and pressure governors have a regulation just broad enough to assure stability. What's more, each type is designed to meet a particular set of requirements as to speed range, regulation, and operating characteristics.

Because of their long and intimate experience with tough turbine-governing problems in many industries and utilities, G-E turbine specialists are good men to know. To get their help, all you have to do is call our nearest office, or write General Electric, Schenectady, N. Y.

The Navy "E" for Excellence, has been awarded to 92,780 General Electric employees in six plants manufacturing naval equipment.

GENERAL ELECTRIC



Inserting a 16 gauge perforated Monel cylinder to complete a separator. Sixty of these units using 180 Monel cylinders are now in service in British supply cargo vessels built under supervision of the U. S. Maritime Commission.

How improved Material and Design for Boiler Accessory

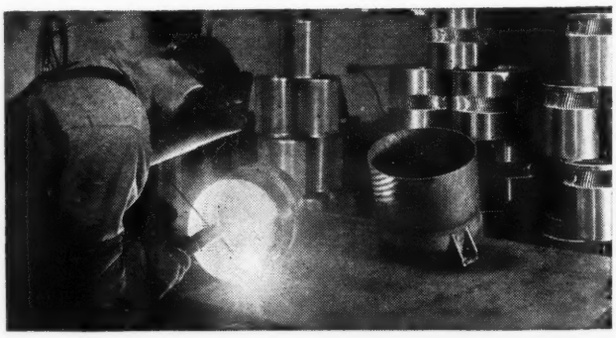
REDUCED COST 30%, WEIGHT 50%

Change from cast bronze to welded Monel sheet also increases life of Steam Separator

The Dri-Steam Boiler Separator is a compact unit mounted inside of the boiler drum. Removing moisture and solids from outgoing steam, it assures dry, clean steam at boiler outlet under all operating conditions.

Some time ago the makers, Dri-Steam Products, Inc. of New York re-designed this unit with excellent results. Cost of the separator was cut one-third. Weight was reduced by one-half. In over two years of actual service not a single failure has been reported.

The change consisted of re-designing the separator to take separating elements made of Monel sheet instead of cast bronze. The bronze had a limited life, frequently as short as three months.



Electric welding a 14 gauge Monel cylinder for the Dri-Steam Boiler Drum Separator.

Other materials were tried, but proved too difficult to work. Monel was finally adopted because it was found amenable to perforating, punching, and spot and electric welding . . . and its combined strength and resistance to corrosion assure freedom from trouble, and eliminate need for maintenance.

★ ★ ★ ★ **INCO NICKEL ALLOYS** ★ ★ ★ ★

MONEL* • "K" MONEL* • "S" MONEL* • "R" MONEL* • "KR" MONEL* • INCONEL* • "Z" NICKEL* • NICKEL

Sheet . . . Strip . . . Rod . . . Tubing . . . Wire . . . Castings

Use Your Oxy-Acetylene Cutting Blowpipes *to* HELP GET IN THE SCRAP!

To help bring in the large amounts of steel and iron scrap so essential to continued high levels of steel production, your oxy-acetylene cutting blowpipes can be used to good advantage. This is true because large tonnages of potential scrap are to be found in obsolete machines, structural shapes, pipe, old boilers, and other pieces too bulky or heavy to be moved conveniently. With oxy-acetylene cutting blowpipes, such material can quickly be cut up for easy handling and disposal. In addition, scrap that is cut to charging box size usually brings higher prices that will more than repay the cost of cutting up. Outlined here are some suggestions that may help you in making available the largest amount of scrap in the least time and with highest returns for your effort.

1. **Explore Your Plant and Property,** and appoint someone to ear-mark every piece of machinery and equipment that can be spared for scrap.
2. **Contact Your Local Scrap Dealer or Salvage Committee** and find out to what lengths the scrap should be cut for highest returns.
3. **Classify and Segregate** alloy steels and other special materials—including copper—whenever it is desirable. Make provisions for doing this during scrapping operations.*
4. **Centralize Your Scrapping Operations** as much as possible. This will speed up the work, will minimize lost motion and rehandling, and also will tie up less equipment and fewer oxygen and acetylene cylinders.
5. **Utilize Local Welding Shops** if you are not equipped to do your own oxy-acetylene cutting.
6. **Move Scrap Fast** when it is ready. Sell it to a scrap dealer—turn it over to your local salvage committee—or give it to a local charity. But get it in!

*To help you identify metals for efficient classification of your scrap, we will be glad to send you without charge as many copies as you need of the wall chart, "Identifying Metals by Spark Testing." *Ask for Form 4666.* Another useful chart that you can obtain from any Linde office is, "Simple Tests for Identifying Metals by Appearance, Chip Test, and Blowpipe Test." *Ask for Form 2299-D.*

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

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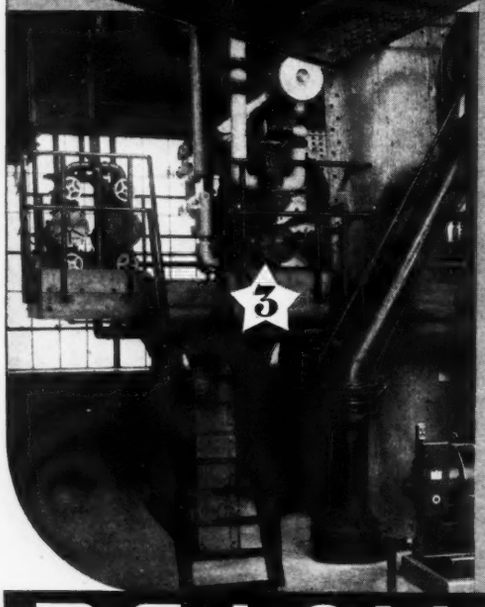
The words "Linde," "Prest-O-Lite," "Union," "Oxweld," "Purox," and "Prest-O-Weld" are trade-marks.

To Avoid Fire Hazard

ISOLATE OIL FROM HIGH-TEMPERATURE STEAM

De Laval turbine driving 4000 kw. alternator (5000 kw. maximum)



IN this De Laval multistage turbine power is transmitted mechanically to the valve-lifting gear 1 at the top of the casing from a pilot-controlled hydraulic cylinder in the sub-base, 2 which also encloses the speed governor, accumulator and relief valve, and other parts relating to the governor control.

The main reservoir for both lubricating and hydraulic pressure oil, the main and auxiliary oil pumps, the strainers, and the oil coolers are located on a platform 3 below the sub-base.

No oil cylinders or oil piping are over the steam chest or the steam piping, thus keeping oil away from high-temperature steam.

Other requirements of high-pressure, high-temperature steam have been met by the use of special alloys and improved design throughout.

Ask for Publication T-3527

DE LAVAL Steam Turbine Co.

TRENTON, N. J.

MANUFACTURERS OF TURBINES . . STEAM, HYDRAULIC PUMPS . . CENTRIFUGAL PROPELLER, ROTARY DISPLACEMENT, MOTOR-MOUNTED, MIXED-FLOW, CLOGLESS, SELF-PRIMING, CENTRIFUGAL BLOWERS and COMPRESSORS, GEARS . . WORM, HELICAL and FLEXIBLE COUPLINGS

VOLUME 86, No. 11

STEAM GENERATION
POWER GENERATION
DIESEL AND GAS ENGINES
PUMPS & COMPRESSORS
PIPING, VALVES & FITTINGS
AIR CONDITIONING, REFRIGERATION
ELECTRICITY AND CONTROLS
INSTRUMENTS AND CONTROL
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WATER TREATMENT
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MISCELLANEOUS

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N O WYNKOOP, *Publisher* PHILIP W SWAIN, *Editor*
Associate Editors: F A ANNETT S A TUCKER L N ROWLEY
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NOVEMBER, 1942

Rockville Centre adds unit, bringing capacity 12,500 hp. 64
Trucks pile 20,000 tons of emergency coal 20 feet deep.. 68
Continuous running won't harm turbines under high loads 71
Automatic control assures process-steam reliability..... 74
Make deaerating heaters suit plant cycle—Part 2..... 76
Adjust motor speed to obtain most efficient operation... 79
Electric-drive ships speed oil to war fronts of the world.. 82
The Old Chief tells how *not* to maintain your plant..... 85
War means refrigerating units must produce more "cold" 86
Ways to cut stoker maintenance, solve war fuel problems 90
Signals supervise air conditioning at Metropolitan Life.. 92
Electric-drive merchant ships—photopage..... 95
Models help engineers solve design, construction problems 98
More photos of Rockville Centre municipal diesel plant.. 102
Wartime Power Clinic—answers to emergency problems.. 103
Vertical pumps adapted to high-lift Newport Station.... 107
Fire hose sluices coal to emergency storage pile..... 110

THE OPERATING ENGINEER

How to install boiler tubes—practical hints..... 111
Dick and Andy—The story of the upside-down boiler..... 114
Practical Aids ..... 116 Headwork Section 120
How to Remove Tubes.. 121 Readers' Problems 122

OTHER DEPARTMENTS

Engineers' Bookshelf ... 134 Data Sheet 138
New Equipment ..... 140 George Edwards 142

A McGRAW-HILL PUBLICATION

Publication Office: 99-129 North Broadway, Albany N. Y.
Editorial & Executive Offices: 330 West 42nd St., New York, N. Y.

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CHICAGO, 520 North Michigan Ave. DETROIT, 2-144 General Motors Bldg.
SAN FRANCISCO, 68 Post St. ST. LOUIS, 455 Paul Brown Bldg.
WASHINGTON, National Press Bldg. BOSTON, 1427 Statler Bldg.
PHILADELPHIA, 16 South Broad St. ATLANTA, 1011 Rhodes Haverty Bldg.
CLEVELAND, 1510 Hanna Bldg. LONDON, Aldwych House, Aldwych, London, W C.2
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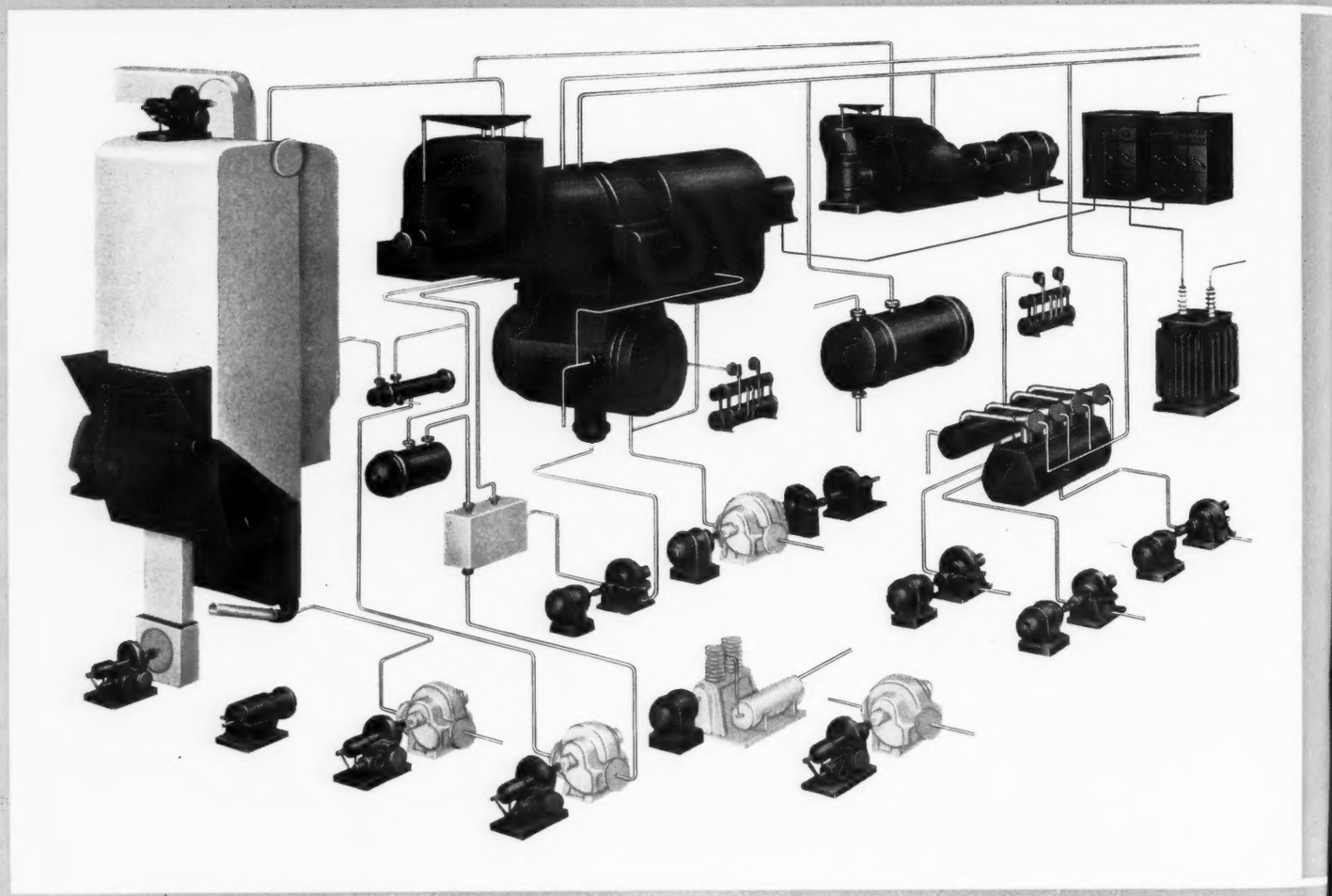
District Managers: S. H. Quarles, New York; C. R. Long, Philadelphia; F. B. Godley, Cleveland; C. Boughton, Chicago; C. L. Morton, Boston
POWER articles are currently indexed in both the Industrial Arts and the Engineering Indexes, available at public libraries. Also every year POWER issues an annual index of its own. Cable Address "McGraw-Hill, N. Y."

"Power Plant Auxiliaries?



for your equipment library...

Copies of any of these publications will be sent to you on request. You'll find them useful, factual—worth-while additions to your library of information on power equipment. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N.

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see steam headquarters first"

Westinghouse supplies

65% of all power plant equipment

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A *complete* range of steam turbines for mechanical or generator drive, from 5 hp to the largest; reduction gears to provide most desirable speed for any drive; condensers for all applications; feed-water heaters, steam-jet air ejectors, make-up evaporators, circulating and condensate pumps, stokers, ash evacuators—plus driving motors, control, and distribution equipment.

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A complete engineering service to help you select and supply the steam equipment for top over-all efficiency and economy in your power plant.

this unit-responsibility will speed selection and installation of auxiliary equipment

You can avoid the difficulties sometimes involved in co-ordinating power plant operation, making sure each unit contributes its full share towards meeting over-all plant efficiency by placing with Steam Headquarters responsibility for solving your steam auxiliary problems.

A glance at the chart shows that Westinghouse supplies a surprisingly large proportion of all power plant equipment—as much as 65%, to be specific. (Westinghouse equipment illustrated in darker color.) Each one of these varied products incorporates in its basic design the combined thinking of product specialists and steam plant engineers. Modern steam practice demands close co-ordination and a high degree of reliability in auxiliary equipment. To get all the benefits of modern steam practice — it will pay you to see Westinghouse first.

J-50419

Westinghouse

Here's another

WAR TIME INDUSTRIAL JOB FOR RADIANT HEATING

... and for

BYERS WROUGHT IRON

What this country needs today are "tight-wad" engineers . . . thrifty not in money, but in materials. Every pound of metal used unnecessarily is a blow to the war effort, and conservation is a patriotic duty.

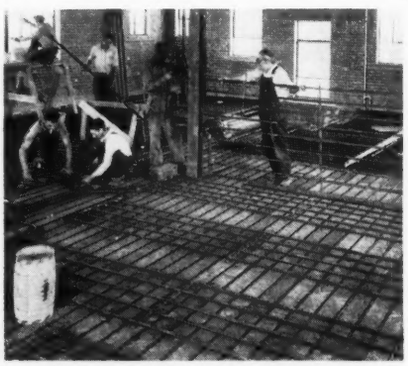
In designing the heating for two new industrial buildings in a large eastern manufacturing plant, the engineers took two important conservation steps: (1) they installed Radiant Heating, and (2) they used Byers Wrought Iron.

Radiant Heating is extremely economical in materials required. A comparative check made on metal requirements, exclusive of boiler, for the heating plant in a small structure showed a conventional hot water system, 1700 pounds; a 2-pipe steam system, 1200 pounds; *and Radiant Heating, 950 pounds.*

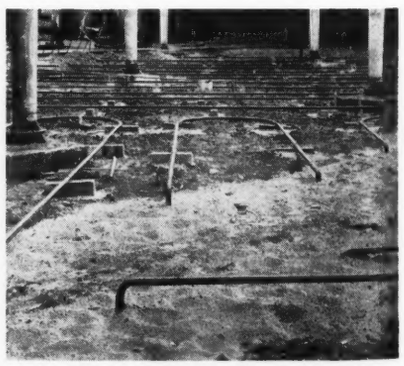
Equally important in real conservation is the elimination of premature repairs. The unusual resistance of Byers Wrought Iron to all the service hazards encountered in Radiant Heating is a matter of engineering record which you can easily verify.

If you have the problem of heating any new industrial structure, we strongly suggest that you check the heating needs against the proven advantages of Radiant Heating. We have records and reports on several hundred installations, which provide practical answers out of practical engineering experience. You will also find our Technical Bulletin, "Byers Wrought Iron for Radiant Heating Installations," very interesting and helpful. May we send you a copy?

A. M. Byers Company. Established 1864. Offices in Pittsburgh, Boston, New York, Philadelphia, Washington, Chicago, St. Louis, Houston, Seattle, San Francisco.



Installing Byers Wrought Iron pipe coils for Radiant Heating in the second floor of an industrial office building. Fuel requirements were far under comparative estimates.



Radiant Heating coils installed in the administration building of a large manufacturing plant. After two years operation, the system was reported as satisfactory in all respects.

Corrosion costs you more than Wrought Iron

BYERS GENUINE WROUGHT IRON

TUBULAR AND HOT ROLLED PRODUCTS

STEEL TUBULAR PRODUCTS

POWER

Established 1882 • PHILIP W SWAIN, Editor

Fish in A Rain Barrel*

By BAYARD E SAWYER

PLEAS for a strong, vigorous meateaters' feeling about this damned war have evidently missed fire, judging by the pap and hominy the writing craft is feeding its readers.

Undoubtedly newspapers, magazines and radio are not entirely to blame, because the government stands over them with the club of censorship—and the pupils are writing to the schoolmaster's specifications. But there is still freedom of speech and the press, and no editor with a conscience can afford to treat this war as a Davis-Cup match.

The fall of Tobruk prolonged the conflict six months, a year and perhaps longer, and there will be more bad innings from sore-arm pitching on our side. But we deserve it and more; America has been lulled into a false sense of security by cricket-party reporting from the fronts.

The British sent a convoy through the Mediterranean—a vitally important convoy, which, if it had gotten through with normal losses, might have prevented the collapse of Tobruk. Though the convoy was horribly battered, news reports carried only tinseled tales of American bombers blasting the bejabbers out of the Italian Navy. We read only breathless accolades about our fliers who said "it was like shooting fish in a rain barrel."

From Coral Sea and Midway it was the same. American aviators rose from the decks of our swift carriers, raced into the dawn and bombed hell out of the Japanese. It was all as easy as sinking a small boy's bathtub armada—just let Yamamoto's yellow dogs show up and we would send them to the bottom with the greatest of ease.

Certainly, nobody wants to read the gloomy sort of reporting that spells doom for our side, but hell's fire, this is a serious bloody war, in which we are up against the toughest possible foe. We won't realize this until too late if we keep getting the high-school cub reporter's version of easy victories. All we've achieved so far is a series of unsuccessful goal-line stands.

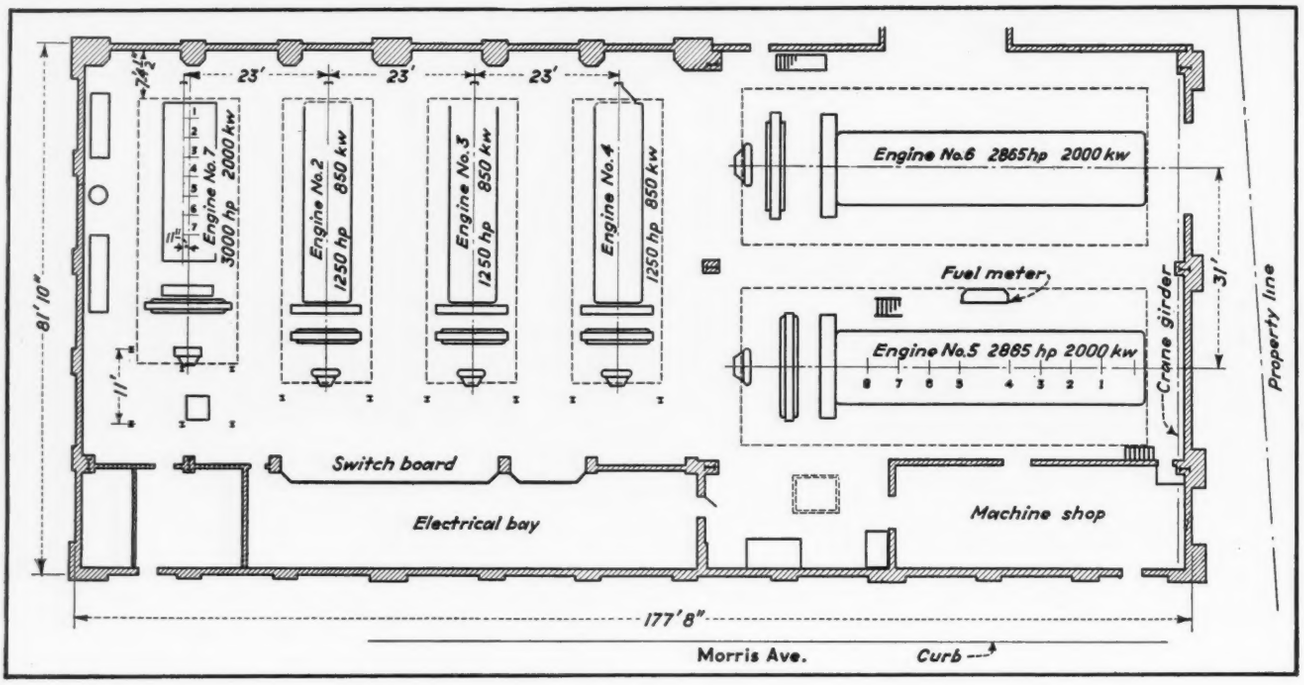
Sure, the United Nations have sunk a lot of Japanese ships in the Coral Sea—but Japan has Java. True, we gave 'em a good jab in the chops at Midway—but they now have several islands in the Aleutians. And the Russians—God bless 'em—have been fighting fools, the only force to take back any German-conquered territory. But Stalingrad totters.

The evil power of Hitler's genius is too strong an acid to be slaked by the feeble alkali of our smugness and derision, and it's about time the writing fraternity got down to the fact that it will be a long, hard, grueling struggle—that the only way we're going to win is for every last mother's son of us to give all we've got. The propaganda handed out so far won't do it; the rosy pink tea we've been drinking isn't going to give anybody war-winning vitamins.

What we need is a strong battle brew—a potent punch that will make us see the tough days ahead and put brawn in our backs to do the work that lies ahead. Shooting fish in a rain barrel is for sissies; let's go whale harpooning like men!

---

* *Reprinted from* Printers Ink. *For the past year Mr. Sawyer has been Sales Promotion Manager of* POWER. *Prior to that he was Associate Editor. He has enlisted for training as a deck officer in the United States Navy and expects the call to new duties shortly after this is published.*



15 YEARS OF SOUND DIESEL PRACTICE

New 3000-hp 2-cycle mechanical-injection engine makes 12,500-hp Rockville Centre municipal diesel-electric plant, begun in 1927, one of the nation's largest

► INSTALLATION of a 3000-hp unit, just completed, brings total capacity at the Rockville Centre, N. Y., municipal diesel-electric plant to 12,500 hp, making it one of the nation's largest diesel stations and climaxing a 15-year record of sound engineering practice and intelligent, thorough-going operation.

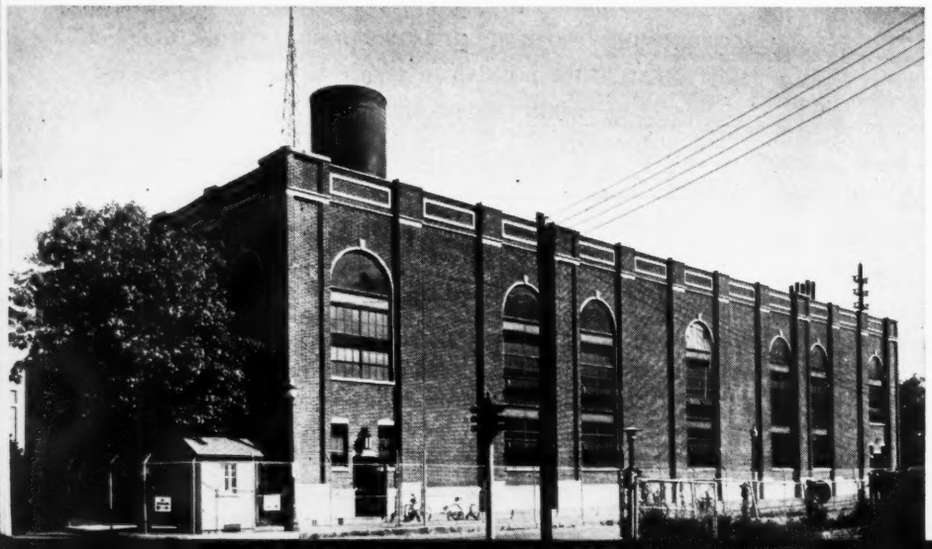
Rockville Centre has operated municipal water and electric utilities since before the turn of the century but the present diesel-electric plant dates from 1927 when rapidly growing load made replacement of the existing steam station necessary. Diesel-engine equipment offered the best solution to the problem of economical power generation for this suburban community and the building shown below was erected to house an 850-hp and two 1250-hp units, which formed the original plant. These were slow-speed 4-cycle air-injection engines selected for reliability and economical performance.

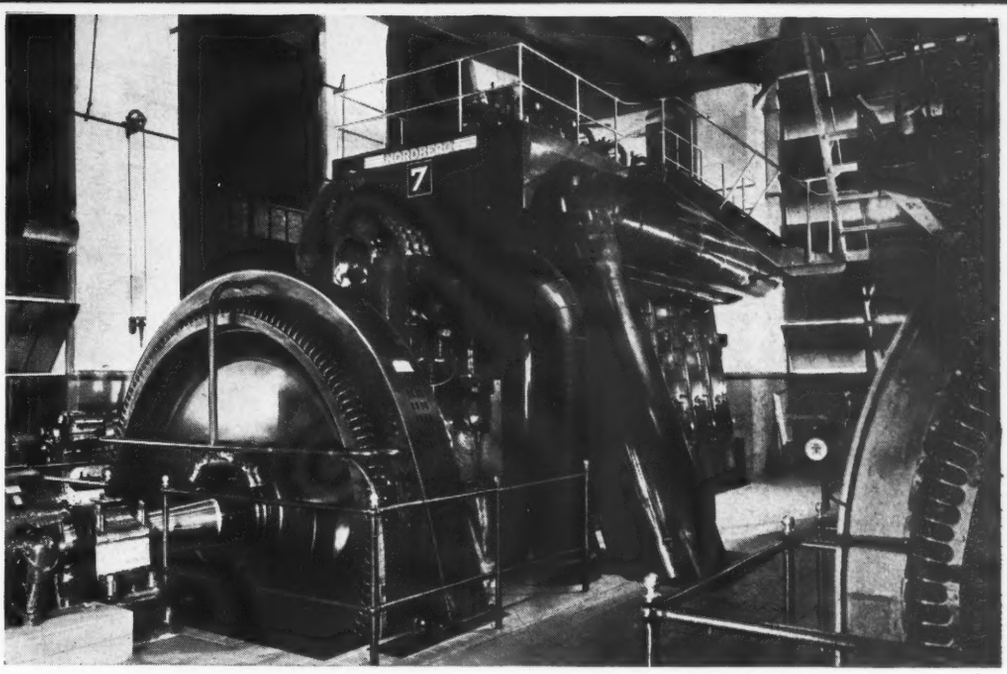
The floor plan above shows the general plant layout; the 850-hp Unit 1 occupied the space now used for the new 3000-hp Unit 7. Another 1250-hp machine went into service in 1930. With the building designed for extension by addition of an ell on the southeast corner, Units 5 and 6 were set at right angles to the older engines. Units 5 and 6, installed in 1933 and 1937, are also slow-speed 4-cycle single-acting air-injection engines, rated at 2865 hp each and at the time were the largest units of the kind in any American power plant.

Continued rapid load growth prior to Pearl Harbor narrowed the station's margin of reserve and dictated purchase of additional capacity.

After a survey of engines available, a 2-cycle solid-injection design was selected. This meant more capacity could be installed in a given space and permitted replacing the original 850-hp Unit 1 with a 3000-hp Unit 7. This yielded a net capacity increase of 2150 hp without extending the building, an economical and practical solution. Mechanical injection having been brought to a high pitch of perfection, it was decided to switch from air injection to gain the higher economy inherent in the newer design.

With the dimout and other military restrictions cutting down Rockville Centre's essentially residential and commercial load, the station faces the difficult years ahead with an ample margin of reserve capacity.





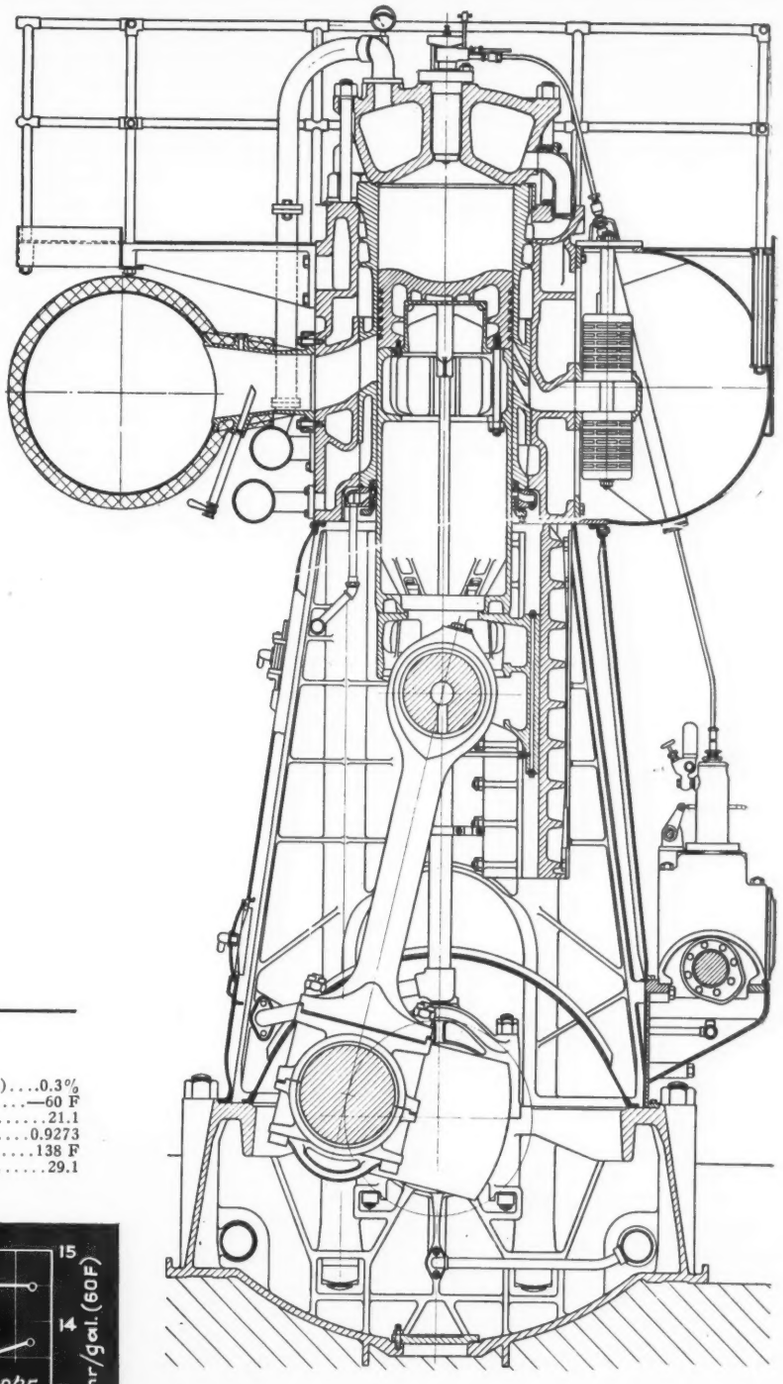
The new engine is a 7-cyl 21½x31-in. 225-rpm 3000-hp Nordberg of crosshead design. Port scavenging provides ability to handle fuels of widely varying characteristics and simplicity of design with a minimum of moving parts. Columns bolted to the bedplate support the cylinders; through-bolts, anchored at the sides and below each main bearing, tie bedplate, columns and cylinders together and take all tensile stresses, frame members being always in compression. Each through-bolt is given the same stress.

The removable cylinder liners carry the scavenging-air and exhaust ports which register with corresponding openings in the scavenging-air manifold and exhaust header. The latter is welded, with a heavy insulated cover. The 2-part piston consists of a heat-resisting head and a wear-resisting symmetrical skirt which rests directly on the crosshead. The cast-steel crossheads, of the flat babbitted shoe type, bear on cast-iron slides and guides bolted between the columns. Crosshead pins run in spun babbitt-lined bushings; main and crankpin bearings consist of steel boxes with removable bearing shells of anti-friction metal.

A circulating pressure system lubricates main bearings, crankpins, crossheads and bearings, governor, camshaft and provides piston cooling. The crankshaft-driven oil pump, located in the sump at one end of the bedplate, forces oil through a strainer and cooler into a header inside the bedplate.

A Roots-type scavenging blower supplies low-pressure air; the engine section at the right shows the path of this air through the automatic scavenging valves and ports into the cylinder. A single fuel pump supplies each cylinder; uniform fuel-line conditions result. An isochronous hydraulic-relay governor varies the effective stroke of the fuel pumps which connect to the governor through a common shaft.

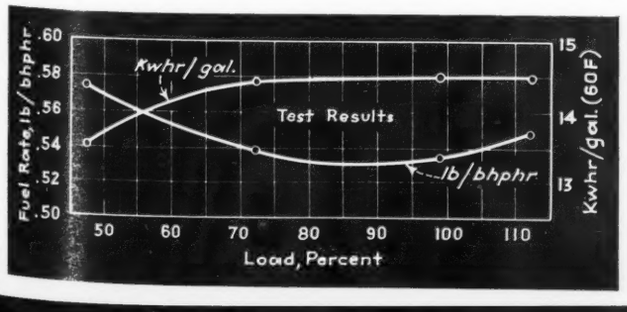
In September the new unit was given a thorough acceptance test and met all guarantees. Performance curves and an analysis of the fuel oil (No. 5 Miranda crude) appear below.

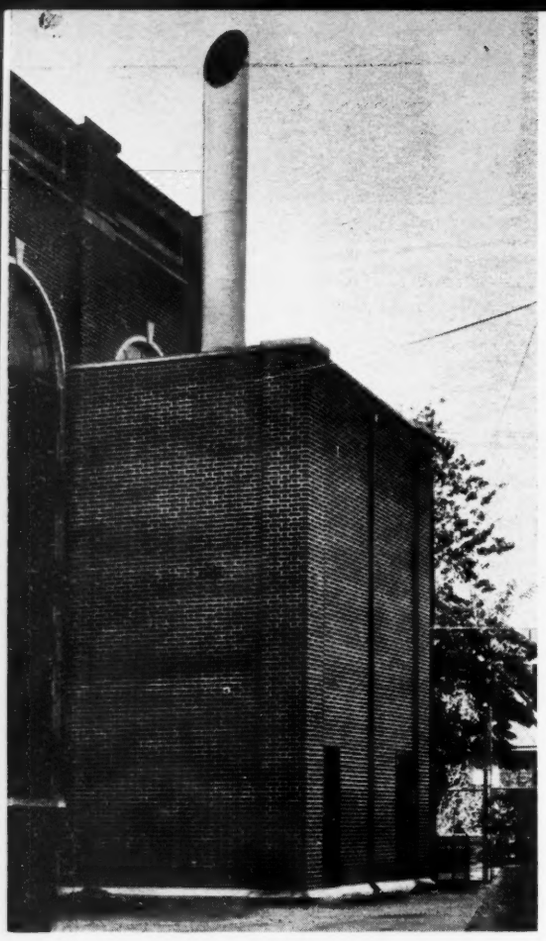


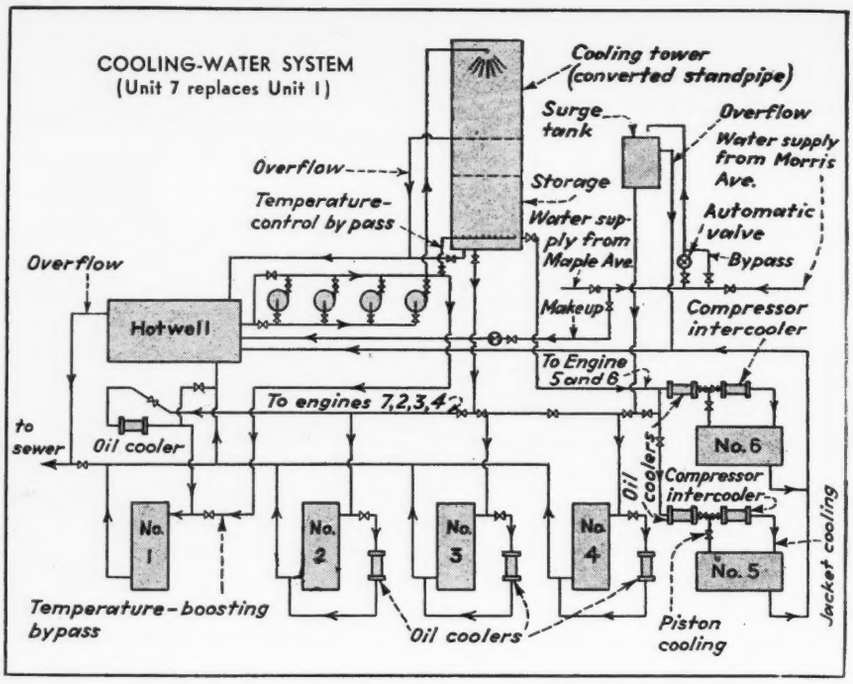
Fuel-Oil Analysis

Conradson carbon	0.59%	Water (by distillation)	0.3%
Ash	None	Pour point	—60 F
Total sulphur	0.24%	Gravity (60 F, API)	21.1
Flash point (Cleveland)	205 F	Gravity (60 F, spec)	0.9273
Viscosity (SSU, 100 F)	78.0	Aniline number	138 F
Sediment (by extraction)	Trace	Diesel index	29.1

Heating value, Btu per lb....19,090





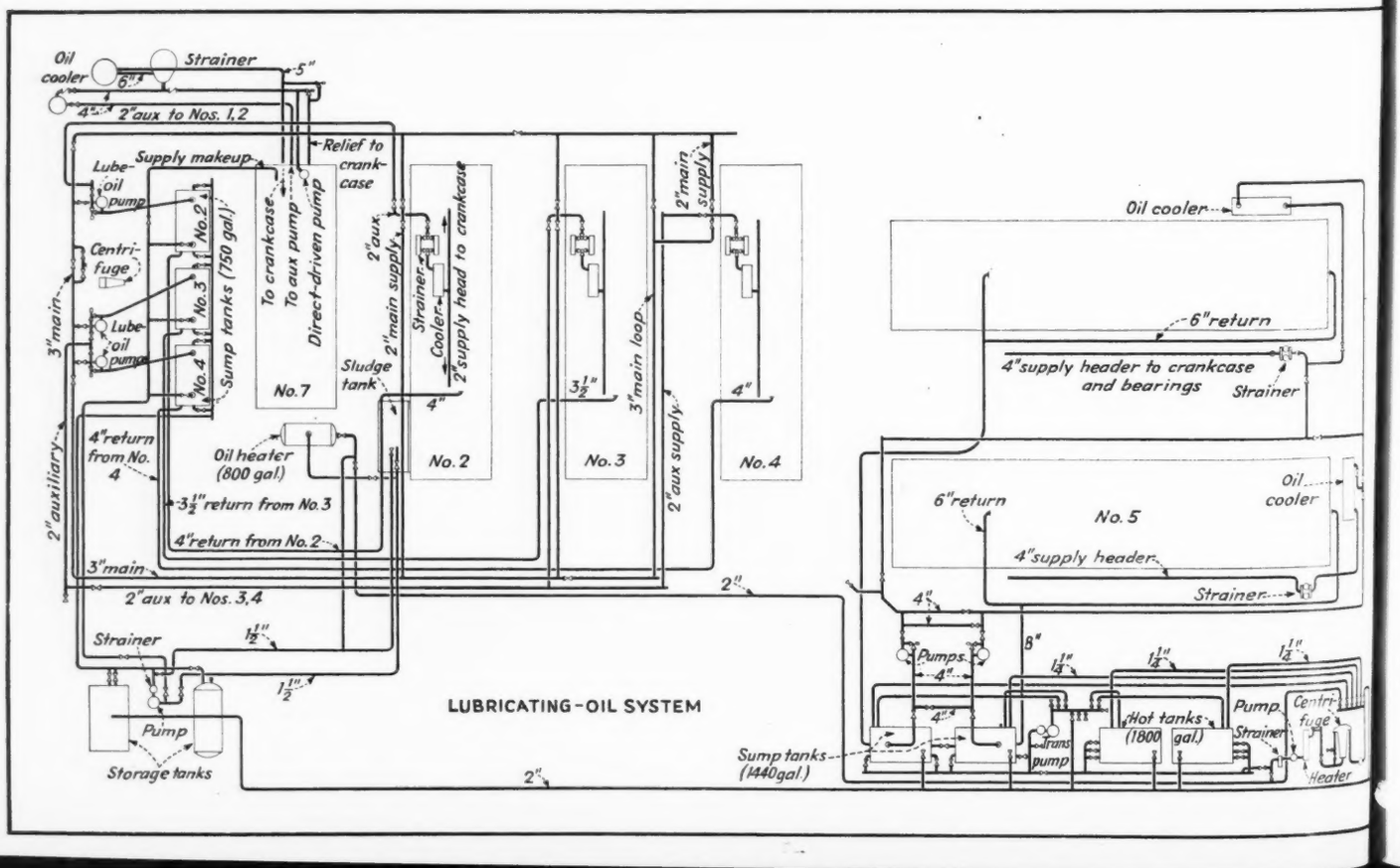


Silencers, for both intake and exhaust on Unit 7, are housed in a brick enclosure at the northeast corner of the plant. A propeller fan, mounted in the division wall between engine room and silencer house, forces engine-room air into the silencer house. In winter, the heated air from the silencer chamber flows back into the engine room through wall louvres, warming the Unit 7 area. Discharging heated air to atmosphere in summer cools the silencer house. Exhaust-gas boilers, connected in bypass lines from Unit 5 and 6 exhaust stacks, supply other heating needs.

Lubricating-oil conditioning plays an important part in low-maintenance operation. The diagram below shows the batch system, with a centrifuge, clean- and dirty-oil tanks and the necessary pumps located at each end of the building. When oil for any unit is to be cleaned, it is discharged to the dirty-oil tank and a reserve clean charge is run into the engine. Settling followed by double centrifuging cleans the used oil. A reclaimer, utilizing activated-clay filtration and low-pressure vaporization, is being installed for continuous operation on Unit 7.

Cooling-system changes to accommodate Unit 7 were relatively minor. The diagram above shows the hookup. Considerable interest attaches to the converted standpipe which serves as a cooling tower. Prior to 1932, cooling water, bought at cost from the water dept was taken from the mains and returned to the sewer. Plant growth and increased water use made recooling necessary and it was decided to utilize a 100-ft-high 20-ft-dia standpipe adjacent to the plant, which had been abandoned some years before.

As the system now operates, circulating pumps discharge to distributors above a redwood filling installed at the top of the tower. A 10-ft propeller fan, driven by a two-speed 20-hp vertical



motor, draws air through openings cut in the tower sides below the filling. The lower part of the tower acts as a storage tank. Location of overflow piping sets maximum water elevation at 67 ft; minimum water level is held at 57 ft. This range means an available reserve, in event of pumping-system failure, of well over 20,000 gal.

Emergency connections from two street mains enter the surge tank on the roof; the open connection prevents backflow. An automatic valve regulated by surge-tank head controls makeup.

Two interconnected main headers supply the engines; all units discharge back into a common hotwell, from which the circulating pumps take their suction. A bypass from the pump discharge line to the storage tank prevents excessively low temperatures in winter. A similar bypass from the pump discharge to the inlet line at Unit 7 permits boosting water temperature at this point. A bypass from the oil-cooler discharge to the engine discharge line allows maintenance of high velocity through the oil cooler.

Fuel oil, now received by tank truck, can also be handled from tank cars. Two 100-gpm pumps transfer oil to the three 20,000-gal above-ground storage tanks. Three 50-gpm pumps handle fuel from storage to the four 500-gal service tanks. A 300-gal tank acts as an emergency unit and a 150-gal weigh tank serves for engine testing.

Electrical control centers in the main switchboard shown above. The six generator panels make up the right-hand side, with two regulator panels occupying the extreme right corner. The central panel carries totalizing power-factor, frequency, watt, watthour, and recording-demand meters. To the immediate left of center stands the station panel, followed by feeder and street-lighting panels. At the extreme left, a panel mounts remote-reading pyrometers for the older engines; a similar instrument will be installed on the right-hand regulator panel for Unit 7. In a bay just beyond the main board, an auxiliary board includes feeder, station-lighting and street-lighting panels and a panel for the tie with the Long Island Lighting Co.

Acknowledgements: POWER's editors wish to thank Henry C. Major, Commissioner of Public Utilities, Wallace A Payn, Gen'l Superintendent, and W E Van Deusen, Chief Engineer, whose cooperation made this article possible. Operation of the municipal system is under the general supervision of the Rockville Centre Board of Trustees: Edgar T Beamish, Mayor; Robert K Atkinson, Walter J Halliday, John J Hayes, and George S Storms.

A future article will present the performance records that make the Rockville Centre plant outstanding and will describe the operating and maintenance methods that make economical and reliable performance possible. For additional photos of the Rockville Centre plant, see page 102.

Principal Power Equipment

Municipal Diesel-Electric Plant, Village of Rockville Centre, N. Y.

Generating Equipment:

	Unit 7	*Units 2, 3, 4*	*Units 5, 6*
Engines:			
Date installed	1942	1928, 1930	1933, 1937
Make	Nordberg	McIntosh & Seymour	
Rating, hp	3000	1250	2865
Type	2-cycle mech-inj	4-cycle air-inj	4-cycle air-inj
No. cylinders	7	6	8
Cylinder size, in.	21½x31	23x32	29x48
Speed, rpm	225	164	120
Governors	Woodward	McIntosh	Woodward
Foundation isolation	.....	.....	Korfund cork mat
Generators: all direct-connected, 2300 v, 2 phase, 60 cycle, 0.8 pf			
Make	Westinghouse	General Electric	
Rating, kva	2500	1060	2500
Exciters: all direct-connected, 120 volts dc			
Rating, kw	30	27	47, 46
Intake-Air System:			
Injection — air filters	.....	American	American
Cylinder — air filters	American	.....	American
Intake silencers	Burgess	.....	Maxim
Exhaust System:			
Silencers	Burgess	McIntosh	Maxim
Expansion joints	Nordberg	McIntosh	Pittsburgh Piping & Equip

Waste-heat recovery: Two Davis Engrg Co shell-and-tube exhaust-gas boilers serve Units 5 and 6, connecting to bypasses from exhaust stacks; an Ilg fan draws heated air from silencer house to heat building at Unit 7 end

Cooling-Water System:

Circulating pumps: One 1000-gpm, two 600-gpm and one 300-gpm, 175-ft-head centrifugal pumps driven by General Electric motors ..... Ingersoll-Rand Co

Cooling tower: Existing standpipe converted in 1932 to cooling tower by addition of redwood filling, distributors and induced-draft fan ..... Foster Wheeler Co

Surge Tank ..... Pittsburgh Des Moines Steel Co

Level-valve control ..... Ross Valve Co
Draft gage ..... Ellison Draft Gage Co
Water meter ..... Neptune Meter Co
Flow indicator ..... Bailey Meter Co
Valves ..... Eddy Valve Co
Temperature recorder ..... Brown Instrument Co
Thermometers ..... C J Tagliabue Mfg Co, Palmer Co

Fuel-Oil System:

Storage tanks, 3, 20,000-gal ..... Pittsburgh Des Moines Steel Co
Transfer pumps, 2, 100 gpm ..... Blackmer Pump Co
House pumps, 3, 50 gpm ..... Blackmer Pump Co
Service tanks: four 500-gal, one 300-gal emergency tank and one 150-gal weigh tank for testing
Oil meters ..... Neptune Meter Co
Filters: Unit 7 ..... Wm W Nugent Co
Units 2, 3, 4 ..... McIntosh & Seymour
Units 5, 6 ..... Cuno Engineering Co
Valves ..... Crane Co, Jenkins Bros, Lunkenheimer Co
Fuel oil ..... Colonial Beacon Oil Co

Lubricating-Oil System:

Mechanical lubricators ..... Manzel Bros Co
Pumps, 6 ..... Viking Pump Co
Centrifuges, 2 ..... Sharples Corp
Oil coolers: Units 2, 3, 4 ..... Alco Products Div
Units 5, 6, 7 ..... Schutte & Koerting Co
Strainers ..... Andale Co, Schutte & Koerting Co
Lube-oil-system alarms ..... General Electric Co, Edwards Co
Oil reclaimer (Unit 7) ..... Hilliard Co
Electric heaters ..... General Electric Co

Miscellaneous Equipment:

Cranes, one 20-ton, one 15-ton ..... Harnischfeger Corp
Hoists ..... American Chain & Cable Co, Yale & Towne Mfg Co
Emergency lighting set (station lighting and lube-oil-pump power): 6-cyl Buda gasoline engine driving 30-kw General Electric generator
Switchboards, electrical instruments ..... General Electric Co
Pyrometers, switchboard ..... Brown Instrument Co
Pyrometer, portable testing ..... Illinois Testing Labs
Starting-air equipment: engine-driven compressors on Units 2-6; can supply Unit 7 from these or from Ingersoll-Rand 3-stage emergency compressor unit

Trucks Pile 20,000 Tons 20 Feet Deep

Skillful operation of heavy trucks permits building emergency coal pile without any other mechanical aids. Step-by-step description shows how to create needed stockpiles in the face of an equipment shortage

▶ THE PROBLEM of creating emergency coal piles of unprecedented size in the face of an equipment shortage places a premium on ingenuity and brings forth many novel solutions. One of the most interesting is that where a 20,000-ton pile, 20 ft deep, was built without any equipment other than rented trucks. Using trucks to pile coal is not, in itself, a new idea, but the carefully worked out procedure here described demonstrates the practical applicability of the scheme to large-scale operations under present conditions.

Casting about for a practical means of piling a large quantity of steam coal in a vacant lot where no handling equipment was installed or obtainable, the company concerned learned that the Guyott Construction Co, of New Haven, had worked out a method for piling coal deep with trucks and had built piles for various institutions and small manufacturing plants in New England. Inspection of some of these piles indicated that the same method

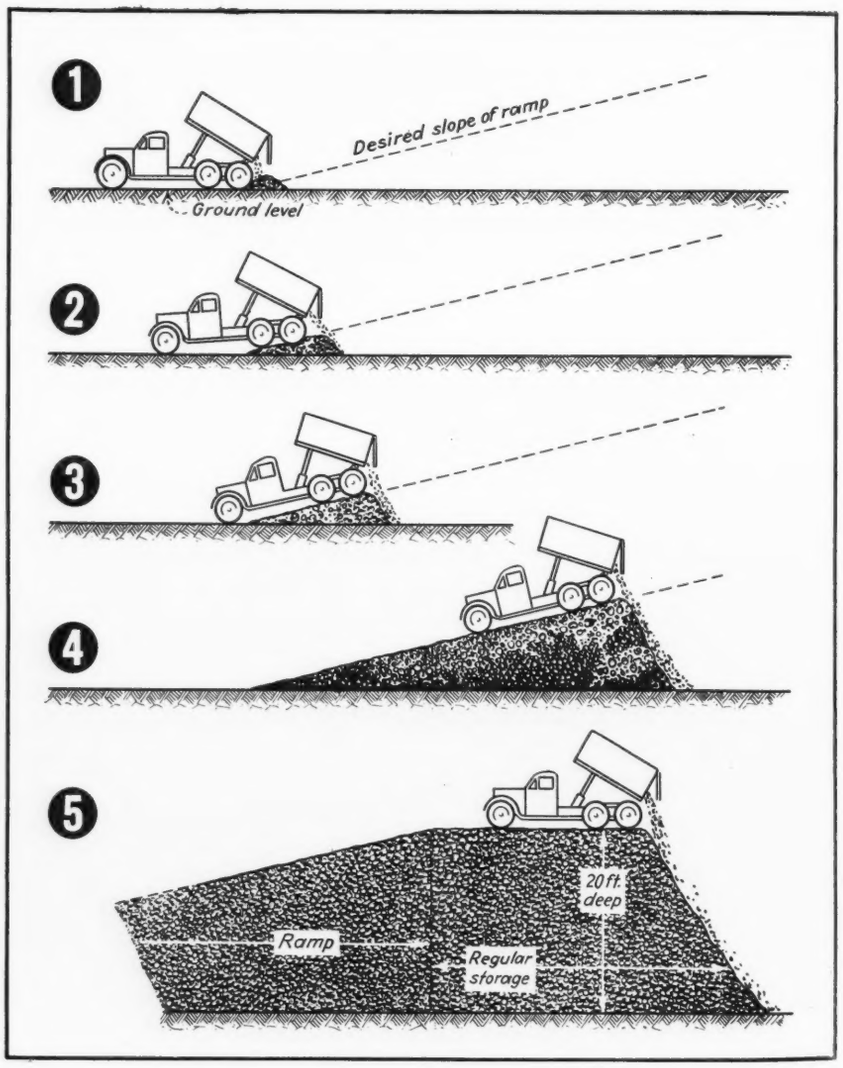


Fig. 1—Here's how coal pile was built: (1) truck dumps and then "seesaws" over pile to compact it; (2) next truck backs up footing, dumps over the high end and compacts; (3, 4) trucks continue dumping and packing to build ramp to desired height; (5) with ramp complete, trucks continue to dump and roll, fanning the pile out at the 20-foot level to suit contour of property

would work for the 20,000-ton storage in mind.

Fig. 1 shows the basic elements in the operation, which starts with the building of a ramp of coal. The truck dumps a load on the ground and then "seesaws" over this little pile a few times to harden it and create a footing. The next truck backs up the slight hump thus produced and dumps its load over the top. Further seesawing compacts the newly dumped coal and extends the incline. By repetition of this procedure, the trucks build a hard-surfaced ramp from ground level to the desired height of the coal pile, in this case, 20 ft. Once the ramp is built, the trucks dump over the high end to extend the pile any desired distance at the 20-ft level.

Trucks Work at Night

The Guyott Construction Co was given a contract to build a pile by this method and started running in a string of 10-ton 10-wheel dump trucks. Both hauling from point of tidewater delivery and piling operations were carried out at night because the trucks were busy elsewhere during the day. The contractor supplied portable acetylene lamps to illuminate the dumping and compacting operations.

Gradually the trucks built the ramp as smooth and as hard as the average dirt road. Fig. 2 shows how the ramp fanned out on the 20-ft level; dotted lines indicate the advancing front of the pile. While building the ramp and first stages of the deep pile, the trucks backed from the ground level to the dumping point. Soon, however, the pile had fanned out to a width giving ample room for maneuvering. Thereafter the trucks drove straight up the ramp, swung around on the high level, and backed squarely to the edge of the pile, as indicated in Fig. 2.

Trucks Make Hard Surface

Constant passage and maneuvering of trucks makes the entire top of the pile, as well as the ramp, a hard smooth surface on which the trucks leave only barely noticeable tracks. After dumping its load, each truck moves forward a few feet while a man fills in its tracks with a shovel. The driver then backs the empty truck and seesaws it a few times to the edge of the pile, thus extending the packed coal floor at the 20-ft level to make a solid platform for the next truck.

The first sectional sketch in Fig. 2 shows a single layer of loose coal covering the entire working surface of the lot. This layer was dumped in the ordinary manner, before the ramp was com-

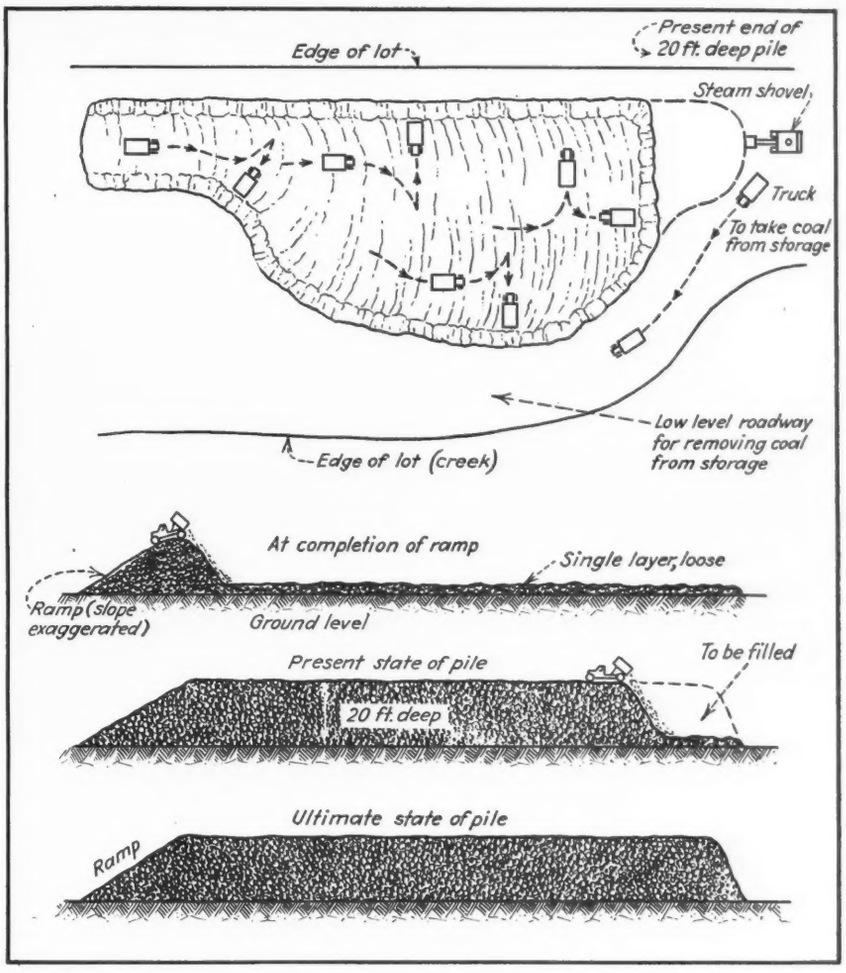


Fig. 2—Plan of pile (top) shows present stage, near completion, and indicates maneuvering of trucks when storing or removing coal. Sections (below) show three stages in building up pile; at completion of ramp, at present stage, and at completion of pile

Fig. 3—Engineer points the way up the hard-packed ramp leading to the 20-ft level of the main pile. Note gradual slope of ramp as actually built up

pleted, and was exposed to weathering for some time before being covered by the deep pile. This preliminary weathering, it was felt, would reduce the chances of heating and fire at the bottom of the pile.

Actually the fire danger is believed small with the eastern Pennsylvania and West Virginia coals stored and with the compacting effect which tends to eliminate the air infiltration required for oxidation. As a safety check, the operators test the pile regularly by forcing a ¾-in. steel rod to the bottom of the pile. After 15 minutes, the operator withdraws the rod and feels the whole length for hot points.

Test Pile Temperature

If any part of the rod feels warmer than the hand (about 98 F) the operator reports immediately so that further tests can be made. If the temperature exceeded about 125 F, operators would make more precise measurements by driving a pipe into the pile and lowering a thermometer in the well thus formed. Thus far no temperatures above 98 F have been encountered.

Pictured near completion in Fig. 6. the pile already contains about 20,000 tons of coal, insurance against any failure of supply for steam and power generation. Because this emergency storage is completely separate from the regular yard and bunker storage of the plant, it will not be touched unless shipments should be shut off for an appreciable period. Thus the emergency pile is basically dead storage.

Trucks Alone Do Job

As already explained, trucks, without aid of other mechanical equipment, built this pile. When the time comes to tap these reserves, the plant will use its steam shovel to load trucks by digging into the edge of the pile at ground level. If there were no steam shovel, a portable conveyor—or even hand shovelers—could be used for this reclaiming operation.

Any such removal of coal will start at the far end of the pile and work back, to leave a continuous 20-ft level to the ramp for future reloading. Last to be removed would be the ramp, viewed as a semi-permanent investment in storage facilities. Only as a last resort will this coal be used.

When the pile is complete a tank truck will spray it with calcium chloride to keep dusting to a minimum.

Fig. 4—Truck starting dumping operation; at each dumping the whole pile moves out a foot or two without losing altitude from the established level

Fig. 5—After dumping, the truck will move forward a few feet while a trimmer fills the tracks with a shovel; then the truck backs to the edge several times to compact the coal just dumped and extend the solid 20-ft level

Fig. 6—The pile as it looks today, virtually completed and holding about 20,000 tons

Continuous Running Won't Harm Turbines

Heavy loads and many months between overhauls will require extra care by turbine-room operating staffs. Mr Campbell outlines five steps that have helped keep turbines in service

C B Campbell, manager of land turbine engineering for Westinghouse South Philadelphia Works, left Michigan to officer the Field Artillery in 1918. He has been associated with Westinghouse turbine design and development ever since

▶ FOR THE PAST YEAR OR SO it has been impossible to install new electrical generating capacity in stationary power plants fast enough to keep pace with the rapidly increased demand. There is but one way by which the slack can be absorbed and that is through more-effective use of units already installed in fuel-burning plants. This means greater average output per unit, more nearly continuous operation, and, very likely, longer periods of service between general inspections.

It does not follow, however, that such greater usage need jeopardize the prime mover, increase its maintenance expense, nor materially affect the useful life of the units in well managed and operated power plants. From the turbine's standpoint, more continuous use in itself is generally highly desirable; high use factors almost invariably result in low cost per unit output, including direct and indirect charges.

Starting Transients

In general, the greatest potential risk of immediate or future damage to a steam turbine exists during the period of putting it into service or shutting it down, particularly, however, in starting. Admission of steam to a thoroughly or partially cooled turbine starts a rapid cycle in which heat is conducted through the rotor and the casing from the surface in contact with live steam, with transient temperature inequalities a function of the relation of masses to heating surface and to the rate of heating. If the starting operation is prolonged a state of semi-equilibrium is reached, after which a further abrupt redistribution occurs immediately after load is added. Such temperature variations cannot be avoided in starting either condensing or non-condensing turbines; they can be minimized only by exercising considerable care. They cause temporary local and general distortions that are not individually harmful, but may well add up to increased maintenance expense after many repetitions; this is particularly true in the case of large turbines.

All turbines are designed to withstand intermittent service commensurate with their size, but with the unit in good mechanical condition and operated under average favorable circumstances, continuous service will almost always enhance unit reliability, as against frequently interrupted operation. Practical observations support this conclusion.

Corrosion of the internal parts of a steam turbine is quite uncommon, though in individual cases it may be really serious. This action occurs almost completely during shutdown periods. Erosion, on the other hand, is, in part, a function of what, and how much erosive substance passes through the unit, and occurs only while the unit operates. It is manifested ordinarily only in exhaust blading of condensing turbines, and then to a marked degree only in a comparatively small number of units. This matter can be treated statistically, based upon previous inspections, as it is not a deterioration that strikes suddenly; progress can be checked at infrequent intervals.

Operation at unit loads averaging higher than formerly should not give particular concern, again assuming the turbine to be in generally good mechanical condition. It is not evident from any available statistical data that load, within the limit of unit rating, has any relation whatever to unit reliability or to total maintenance expense. That this is the case, in spite of the fact that most operating stresses are higher the greater the load, means that they are balanced by the thermal problems of wide load fluctuation or shut-downs, or that turbine designs are properly conservative, or perhaps both.

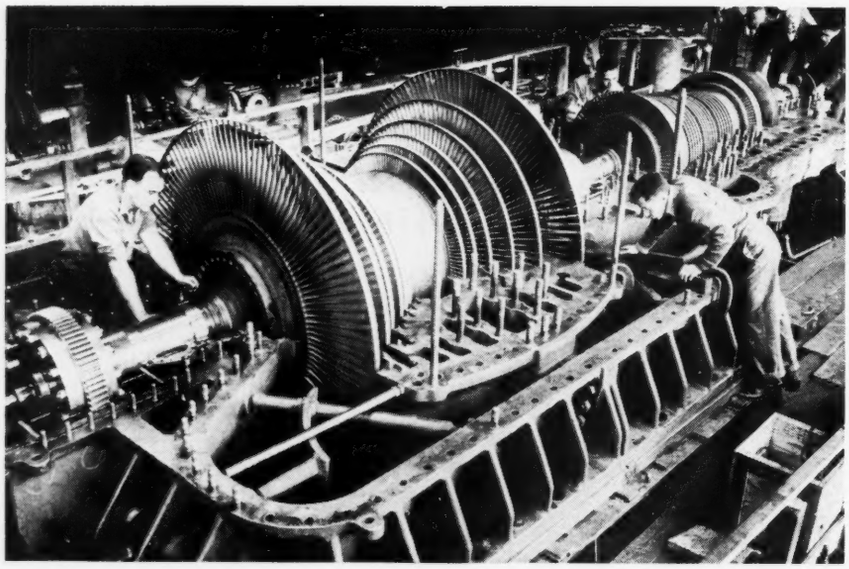
All the latest devices to minimize vibration and maintenance are incorporated in this 820-psi 825-F 42,857-kva 0.7-pf 3600-rpm air-cooled unit with flexibly mounted generator stator

Operators' Forethought

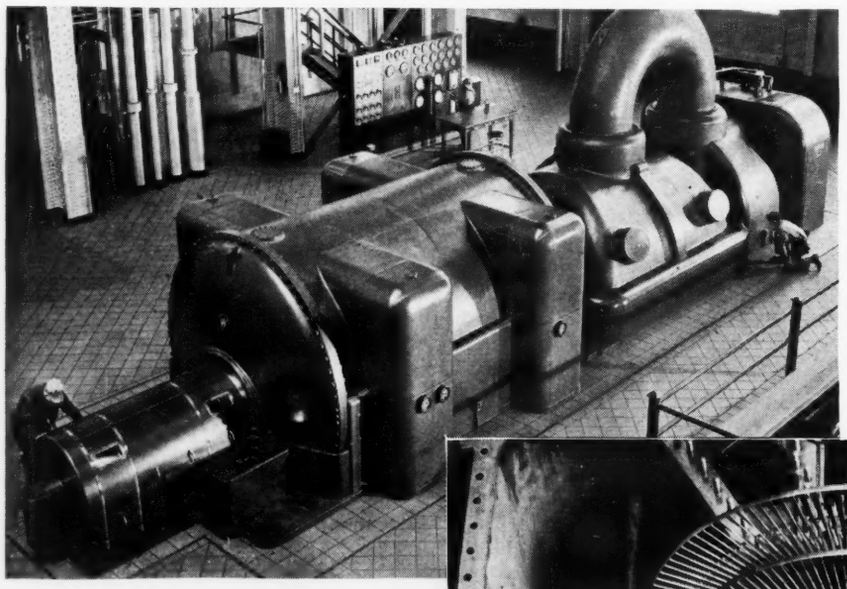
Greater dependence on existing turbines to develop increased loads materially increases the responsibility of the operating engineers. It calls for greater analytic thought relating to general operating procedure. The following five specific suggestions are offered, not that they alone cover the field, but that they suggest other desirable approaches to meet the challenge.

A complete and detailed "case history" should be compiled for each turbine; this should include a description and an analysis covering any unusual circumstance noted in its operation as well as of any noteworthy condition found during inspections; also, a statement of what corrective measures were taken, or planned. Such history should be used periodically in a review of general plant conditions; it may direct attention to the desirability of revising boiler arrangements or operation from the standpoint of carryover or superheat control, revising starting and stopping methods for the turbine or its auxiliaries, generator loading programs, or any one of many other possibilities.

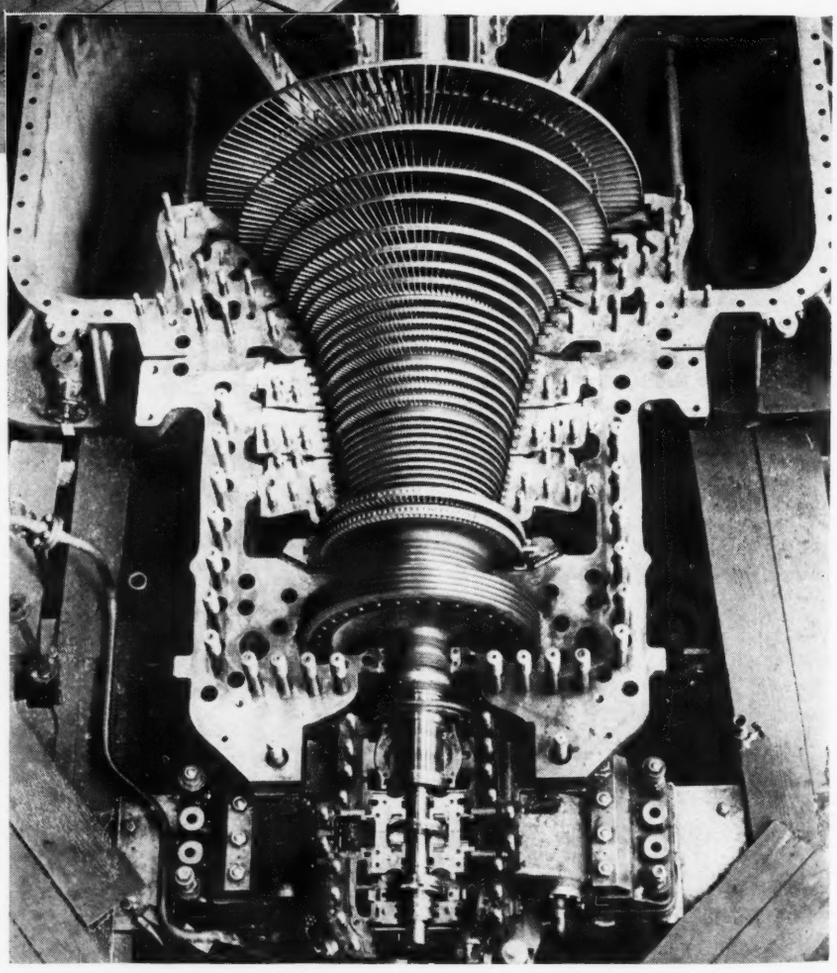
The operating log, usually of hourly



Inspection should be thorough and all-inclusive to place units in shape for possible long operating periods between scheduled outages



Large machines, such as this modern steel-encased giant, are the backbone of the nation's steam-generated power

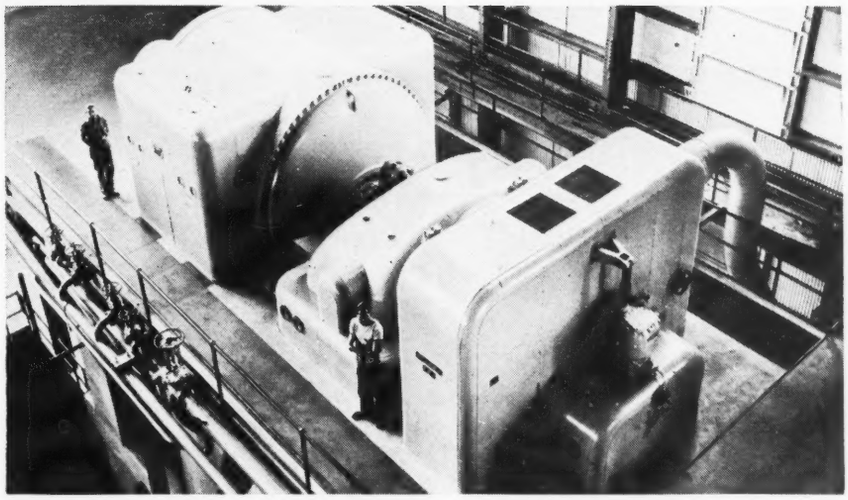


A 25,000-kw turbine open for inspection

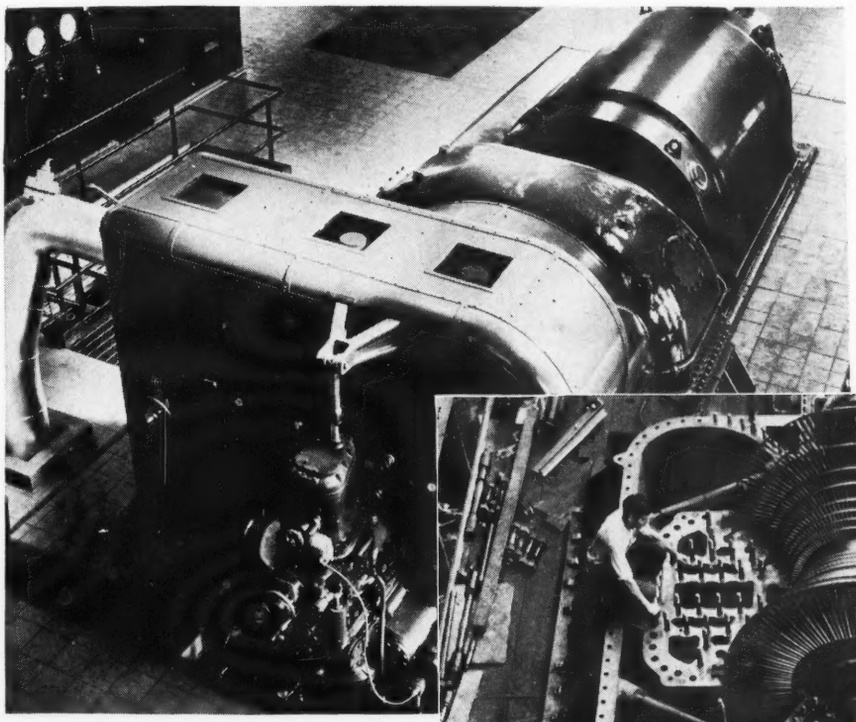
readings, can be made more than a chore by insuring that it contains all of the pertinent information, and no more. In the first place, instruments should be maintained so that they indicate or record correctly. Many older turbines in particular were installed with a bare minimum of operating instruments, leaving much to personal judgment. Consideration might be given to improvising better facilities for the operator in such cases. The primary point of the log should be to supply a running record for current analysis and detection of undesirable variations in their early stages, not just to accumulate inactive data; frequently they are filled with obvious inaccuracies which make their value questionable.

Elapsed time or cumulative operating hours are generally used as the guide in making inspection schedules. The intervals allowed between inspections vary between wide limits. Specific recommendations on this matter are not warranted, since the period will be regulated largely by past experience and to some extent by unit availability. In some instances inspections are regarded as *preventive* and are relatively frequent as compared to the longer intervals between *corrective* inspection; the meaning of these terms, referring to trouble prevention or correction, is fairly obvious.

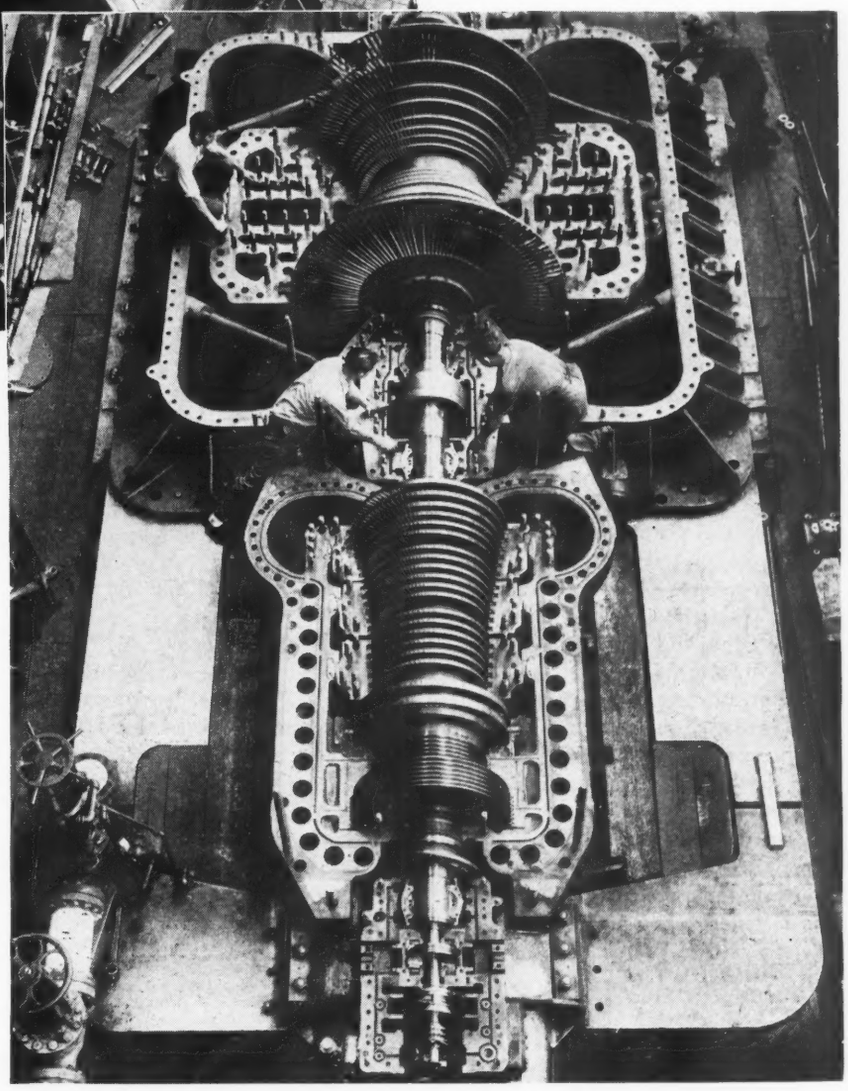
With no prior experience to guide the making of inspection schedule, that is, with a new turbine, it seems most reasonable to make a complete inspection within a year of the initial operating date. This will give confirmation of all the major installation details, or, even more valuable, will direct attention to any unsatisfactory details and present them for prompt correction perhaps before the situation becomes a serious problem. Such early inspection is particularly valuable in a new plant, or in an addition to an existing plant when served by new boilers, where unexpected carryover deposits on blading, or corrosion may be found promptly. This will probably become the most valuable datum point in the turbine's entire "case history."



Modern engineering, typified by this 25,000-kw 3600-rpm hydrogen-cooled turbine generator, wrings more power from each pound of coal to help win the war



Small turbines like this 15,000-kw 3600-rpm machine, will play an important part in local power pooling



Thousands of precision-finished stainless-steel blades receive a final check before being shipped from South Philadelphia. Tip speeds run up to 850 mph

Several operating companies have found it worthwhile and instructive to make a fairly complete periodic check of the indicated internal condition of a turbine while it is in regular operation, this being a particularly valuable procedure in the event of long periods of service between inspections, and is recommended in practically any case at least with the larger units. For this purpose some fixed nominal reference load is selected and as complete information as practical obtained on steam flow and intermediate stage steam pressures and temperatures.

Such periodic test data are compared with preceding values going back to the early operation of the turbine; by variations in stage pressures the presence and extent of blade scale deposits or mechanical damage can be detected; by variations in the stage enthalpy measured by steam pressures and temperatures in the superheat zone any important change in internal stage efficiencies may be detected. Such a test is very convenient in those turbines operating with regenerative feedwater heating where enthalpy at intermediate stages is readily obtained. The results furnish a most rational indication of the absolute need of turbine inspection of the *corrective* nature. On the basis of such records at least one large turbine has now been continued in service without complete internal inspection for well over six years.

In the foregoing repeated reference has been made to blade scale deposits caused by carryover from the boiler. From the standpoint of safety, checking such deposits on governor or overspeed trip valve stems is even more important so that these valves can shut off steam supply in emergencies.

Automatic Control Insures Process-Steam Reliability

C R Earle, Republic Flow Meters Co, shows how controls govern operation of reducing and desuperheating stations installed to maintain low-pressure steam supply in a war plant

▶ IN A NEW MID-WESTERN POWER PLANT for a large cellulose-products works, uninterrupted supply of steam and electricity to processes is of paramount importance to insure against shut downs that would be costly in time and materials. Accordingly, automatic control equipment has been installed wherever feasible. The boilers operate under an automatic combustion-control system to insure uninterrupted steam generation (POWER, April, 1942, p. 80). Turbine exhaust steam supplied to the processes is supplemental or replaced by steam from the high-pressure boilers under control of pressure-reducing and desuperheating systems.

Steam Generation

All steam for the plant is generated at 550 psi, 700 F by two Combustion Engineering Co steam-generating units, fired with pulverized-coal and fuel oil separately or in combination. These boilers supply high-pressure steam first to two General Electric Co 2500-kw turbine-generators. Both turbines exhaust at 20 psi to the processes. In addition to this low-pressure steam, a small amount of steam at 150 psi is required for other process equipment. The turbine-generators produce all electric power required to operate the works even though there is a connection to the power lines of the local utility for emergency supply.

Under these conditions, it was necessary to make provision for supplementing the 20-psi turbine-exhaust with live steam from the 550-psi boilers at reduced pressure and temperature so that there is always sufficient 20-psi process steam regardless of turbine load.

To do this, the Republic-Smoot pressure-reducing and desuperheating system was installed, Station No. 1 in the figure. Another pressure-reducing and desuperheating system, Station No. 2, was installed to supply 150-psi steam. The two systems are entirely independent in operation, although their automatic controls and instruments are installed on the same panel, thus centralizing the control at one point.

Station No. 1 operates in parallel with the two steam turbines, supplementing their exhaust by supplying steam from the 550-psi header to the header delivering 20-psi steam to the works. Turbine exhaust supplies to processes a maximum of about 150,000 lb of 20-psi 400-F steam an hour. The reducing station normally supplements the turbines in supplying the process-steam load.

To obtain the necessary wide range of operation under these conditions Station No. 1 is designed, as shown, with a single reducing valve *V* for controlling the pressure in the 20-psi header and two steam-atomizing desuperheaters *A* and *B*, operating as described below, for controlling the temperature.

Reducing-Valve Operation

Reducing valve *V* is a 5-in. cylinder-operated turbine unit, built to the 600-psi standard, controlled by a measuring oil-operated regulator *R* mounted on the valve as shown. This regulator is in turn controlled by a master loading-air pressure from a master controller *M* on the panel. This master controller, in response to pressure variations in the turbine exhaust-steam header produced by fluctuations in process-steam demand, dispatches to the regulator a master loading-air pressure inverse to the steam-pressure changes. If turbine-exhaust steam fails to satisfy process demand, 20-psi header pressure falls below normal. This causes the master controller to increase the master loading pressure to regulator *R* to admit enough 550-psi steam to the low-pressure header to maintain its pressure at 20 psi. Increase of 20-psi header pressure above normal reverses operation of regulator *R* and causes the reducing valve to start closing.

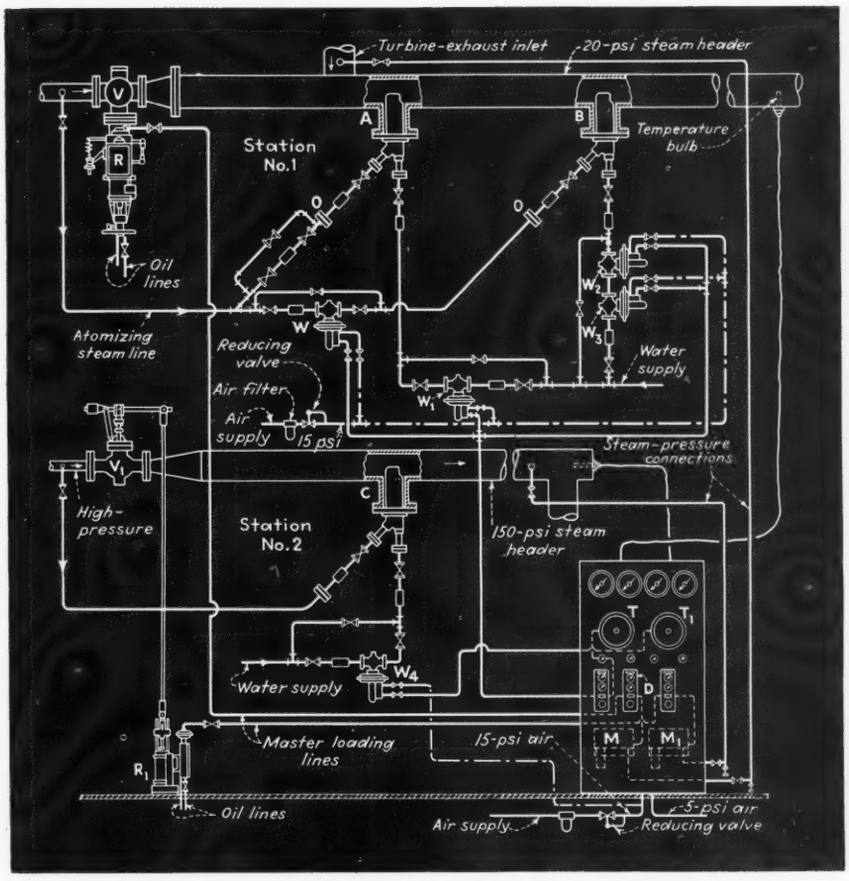
Master controller *M* is fully compensated to hold constant low pressure. It includes an automatic-to-manual transfer on the control panel at which the operator, by a hand-operated air-pressure controller, *D*, may position the reducing valve manually.

Desuperheater Water

Desuperheaters *A* and *B* are direct-contact steam-atomizing units. Desuperheating water is atomized in the nozzle at the point of injection by the impact of a small amount of 550-psi steam. Atomized desuperheating water, completely evaporated by heat absorbed from the steam in the line mixes with the steam, thus reducing the temperature of the mixture. Atomizing steam is supplied at a relatively constant rate through limiting orifices *O*, in the correct amount to atomize the water thoroughly at all rates of steam flow in the line.

Desuperheating-water supply is adjusted to maintain the required temperature in the 20-psi header. Operation of diaphragm-motor water valves W_1 and W_2, controlled by air-loading pressure from the temperature control board, adjusts desuperheating-water supply to maintain required temperature in the 20-psi header. The temperature controller also operates water and steam shut-off valves *W* and W_3 for desuperheater *B* as explained below.

If turbine exhaust steam is sufficient to maintain the 20-psi header pressure at normal, master controller *M* and regulator *R* hold the reducing valve *V* closed. If the pressure drops below normal, the master controller causes the valve to admit sufficient live steam to supply the deficiency, thus maintaining the pressure in the 20-psi header. Regardless of whether the steam flowing to the desuperheaters in the 20-psi header comes from turbines alone, reducing valve alone, or is a mixture of the two, the two desuperheaters *A* and



Reducing-valve and desuperheater controls maintain 20- and 150-psi steam supply

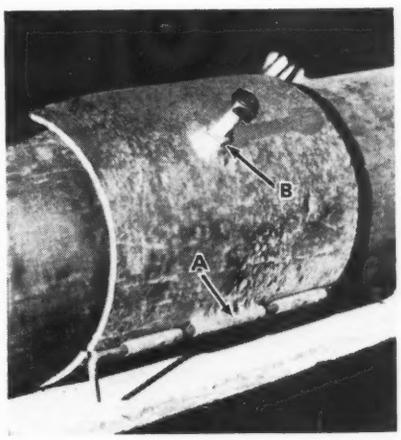
B operate in series and in sequence to maintain the steam temperature at 400 F. This is done in the following manner:

Desuperheater *A* is designed to be in operation continuously from a minimum flow of about 4000 lb of steam per hour up to about 50,000 lb from the reducing valve or equivalent flow from the turbines. Process machines are frequently operated so that the total steam demand is within this range. Above that amount, desuperheater *B* cuts into service automatically and the two desuperheaters in series maintain the steam temperature at 400 F up to the maximum flow of 150,000 lb per hour through the reducing valve or 300,000 lb per hour total for turbines and valve. These operations are entirely automatic and the only manual control required is in case of a total shutdown of the plant, when the valves of desuperheater *A* must be closed by hand to shut off the supply of desuperheating water and atomizing steam to that desuperheater.

Temperature controller *T* and valves are set so that whenever any steam flows from turbine exhaust or reducing valve or both, the controller will operate water control valve W_1. This valve supplies the correct amount of water to desuperheater *A* to maintain the header temperature at normal for a steam flow up to a maximum of 50,000 lb per hour from the reducing valve.

When the flow of water to desuperheater *A* reaches a maximum and 20-psi-header temperature rises above predetermined normal value, air-loading pressure from temperature controller *M* causes water and atomizing-steam shutoff valves W and W_3 to open. Atomizing steam will now flow to the nozzle of desuperheater *B* and valve W_2 will be positioned by the temperature controller to supply the desuperheating water required by desuperheater *B*, operating in series with *A*, to hold the header temperature at the set value. When the 20-psi header temperature again decreases to the value that can be maintained by desuperheater *A* alone, the temperature controller causes valves W, W_2 and W_3 to close, thus cutting desuperheater *B* out of service until it is again required.

Pressure-reducing and desuperheating Station No. 2 is installed to supply about 6000 lb of steam per hour from the high-pressure header at 550 psi nd 400 F, to steam jets and certain other process equipment. This station is entirely separate from Station No. 1. Its 1½-in., 600-psi standard, lever-operated reducing valve V_1 is controlled by a master controller M_1 and valve regulator R_1 connected as shown, in the same way as the valve of Station No. 1. Since the station operates practically continuously, atomizing steam for desuperheater *C* is valved manually, while desuperheating water is controlled by a temperature controller T_1 operating valve W_4 to supply the correct amount of water to hold the 150-psi-header temperature constant.



Simple Device Holds Gas Bottles Securely

THE PROBLEM OF TRANSPORTING oxygen and acetylene bottles in an out-of-the-way but safe place on the field truck, prompted one plant welder to devise the simple method in the photo. A 12-inch section of pipe having an internal diameter about ½ in. larger than the outside diameter of the bottle was cut in half lengthwise. One side was hinged, while to the other side three ¼-in. pipe nipples, 3 in. long, were welded on alternate sides of the opening in such a position that a light steel rod could be slipped through the nipple, holding the two half-sections together as at *A*.

In this case the lower pipe section was welded to the base of the truck running board so that the bottle could be held in it in a horizontal position. A ½-in. nut was welded over a hole in the top pipe half, and a machine bolt with its end cut flat and smoothed, was screwed tightly against the bottle at *B* to hold it firmly in place. This device can also be used to hold gas bottles in an upright position in a shop to prevent them from being tumbled over. In such applications the tightening screw can be omitted.

Pomona, Calif. GILBERT M WILSON

Make Deaerating Heaters Suit Plant Cycle—II

Methods of getting best performance from constant-pressure direct-contact heaters discussed by Warren P Spining, application engineer, Worthington Pump & Machinery Corp

▶ PIPING AND CONTROL ARRANGEMENTS for a direct-contact heater that operates at constant steam pressure differ from corresponding connections for operation at variable pressure from an uncontrolled turbine bleed point. Problems of constant-pressure operation will be discussed in this article; variable-pressure installations will be covered in a future issue.

Assuming that heater steam pressure has been selected and total amount of water storage has been determined according to methods previously suggested (POWER, October, 1942 page 87), two major questions remain to be considered. First, should all the water storage be incorporated within the heater itself or some part contained in a separate surge tank? Second, what control of water and steam flows is necessary to insure continuous satisfactory automatic operation under all load conditions?

The simplest arrangement, Fig. 1, stores all deaerated water within the heater shell. Water and steam mix in the tray section. Heated and deaerated water collects in the lower portion of the heater shell or in a separate tank mounted directly below the heater.

In the latter scheme, the tank should have several inches of vapor space above the maximum water level, connected to the steam space of the heater by an equalizer pipe of ample size, so that water can flow freely into the tank and vapor can escape to the heater. This connection also provides for escape of flashed steam in the event of sudden drop in heater pressure.

All condensate and returns are usually piped directly to the heater without control. Regulating valve controls makeup only. Storage capacity of the heater is made large enough to accommodate, above the normal working level, the maximum excess of returns over boiler-feed requirements for the full length of time that such an excess can exist.

To illustrate, an institutional heating system with a normal load of 60,000 lb per hr of steam might require 100,000 lb for the first morning hour. If returns continue at the 100,000 lb-per-hr rate for 15 minutes after steam output has fallen to normal, the heater should have a storage capacity *above the normal working level* of (40,000-lb-per-hr excess returns for one-quarter hour) 10,000 lb. If less storage is provided, valuable heated water will overflow to waste.

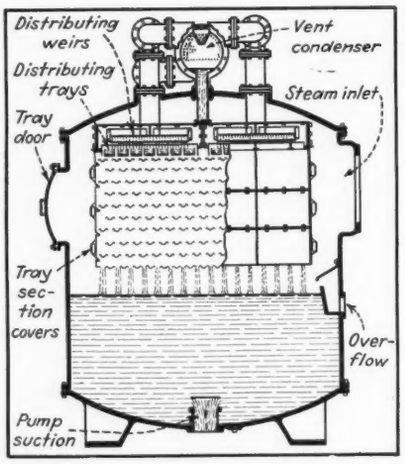


Fig. 1—Simplest direct-contact heater brings steam and water into contact over a series of trays, stores deaerated water in lower portion of shell

The amount of storage required below normal level depends on the reliability of water supply. If there is a risk of shutoff of process returns or failure of makeup, storage below normal level must be adequate to keep boilers from going dry until another water source can be cut in by hand or, as a last resort, until the fires can be killed. If the system is such that condensate always must return to the heater in proportion to steaming output, the amount of storage can be small. However, the effect of stored water in making up for peak loads of short duration should also be considered.

The total storage above and below normal level can be redivided to a certain extent, should conditions warrant, after the heater starts operation. The actual working level can be changed by adjusting the linkage between the makeup regulating valve and the float, or by changing elevation of an outside float chamber.

The deaerator of Fig. 1 needs only one water-inlet regulating valve. If a secondary or less-desirable source of makeup is available, it may be connected to the heater through a second valve with a float control set for low level so that water would be admitted only in event of inadequate quantity from the primary source of supply.

The advantages of incorporating all water storage in the heater itself lie in the simplicity of the system, the instant availability of the stored water and the effect of the extra heater storage on reducing peak loads on the heater. Disadvantages are those of first cost, radiation losses and space limitations.

Heat Loss Greater

Water stored in a heater reaches a relatively high temperature, under pressure. The cost of heater storage tank or compartment may be much greater than of an open tank of equal volume. Assuming equal lagging, more heat will be lost from water stored in a heater than an equal amount stored in an open tank at lower temperature. In general, the greater the actual amount of storage required the more favorable a separate surge tank appears. As a rough guide, storage can be economically built into the heater itself when the total storage required does not exceed 10 minutes operation at full load. For quantities greater than this, at least part of the water might better be stored in a surge tank ahead of the heater.

If a separate tank is necessary, the designer has a choice of three basic arrangements (1) an open tank feeding the heater by gravity (2) a closed tank feeding the heater by gravity and (3) an open tank from which water is pumped to the heater.

The first of these, Fig. 2, is simplest and most common. All condensate returns flow directly to the surge tank. Makeup is added to the surge tank as required by a float-controlled valve set fairly low in the tank. The mixture of condensate and makeup flows by gravity to the heater, controlled by a single float valve on the heater.

With this system it is advisable to equip the heater with an emergency makeup connection from the plant's most reliable water supply, controlled by a float valve set low on the heater.

Normally this emergency valve remains closed and all water comes from the surge tank. Since the normal makeup mixes with the condensate returns in the tank, the average water temperature at the heater inlet will be much more constant than could be obtained if only the condensate flowed through the tank and the makeup were added directly to the heater. By maintaining inlet temperature reasonably constant, fluctuations in heater steam requirements are minimized.

The disadvantage of the system of Fig. 2 lies in the need for elevating the surge tank some distance above the heater to assure flow from tank to heater under all load and pressure conditions. Sufficient head must be available to overcome maximum possible steam pressure in the heater, plus friction loss through the vent condenser, regulating valve and piping. Of these factors, steam pressure is usually known and friction in the piping can be readily calculated. Friction loss in the vent condenser can be obtained from the manufacturer and will usually be within a range of 2-5 ft of water at full load.

Where low vent-condenser friction loss will simplify the installation, this requirement should be stated in any inquiry or specification, because vent-condenser design is affected. Loss through the regulating valve depends on size and type of valve. An oversize valve will have low loss but will give poor regulation. With too large a valve, a slight drop in water level in the heater causes a large increase in water flow into the heater.

If steam supply is limited or not perfectly controlled, sudden increase of inlet water flow and corresponding increase in steam requirement of the heater will cause some steam-pressure drop in the heater; this, in turn, reduces the backpressure on the downstream side of the regulating valve, making a further increase in water flow.

Such a condition of increasing water flow and decreasing steam pressure can continue until pressure drops below atmospheric, the vacuum breaker opens and the heater becomes airbound. Opening to atmosphere usually holds pressure steady enough to allow the rising water level to close the water-

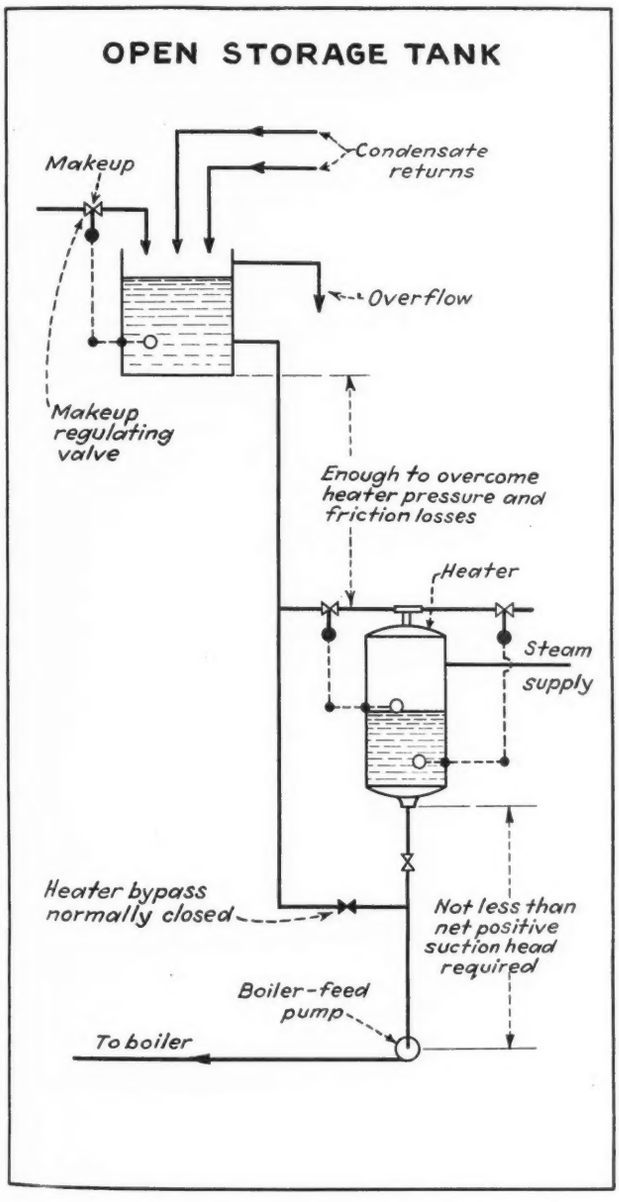


Fig. 2—Pipe and valve arrangement for extra storage in open surge tank with gravity feed to direct-contact heater. Low-level float controls emergency makeup supply

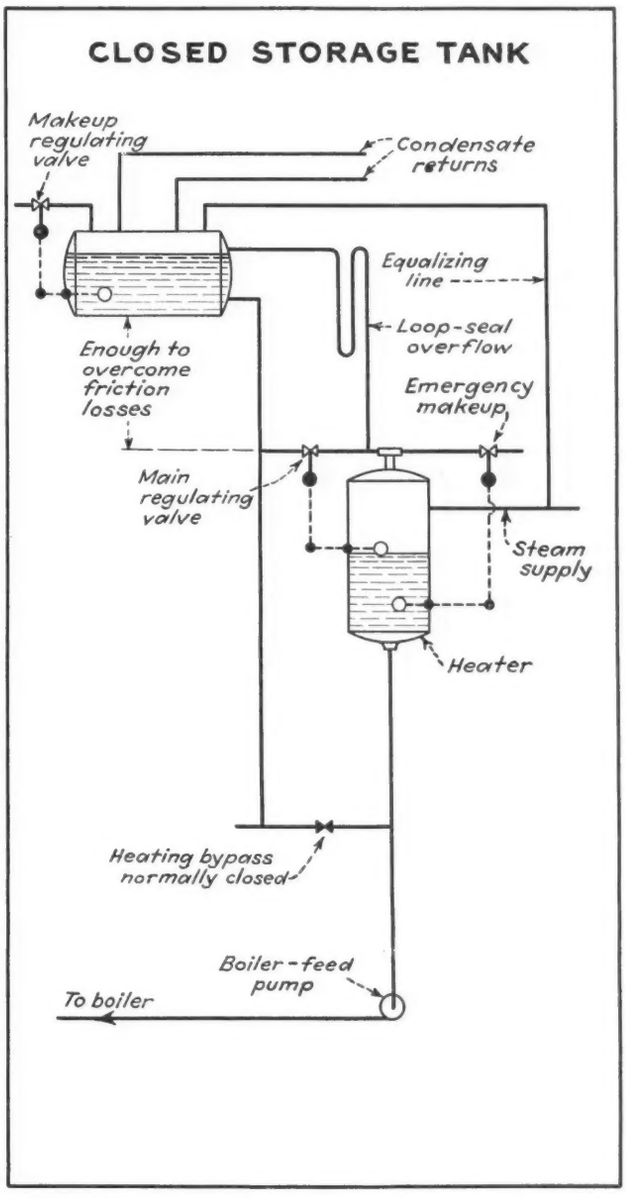


Fig. 3—Elevation of the extra-storage tank can be reduced by this arrangement of closed overhead tank designed to carry same pressure as the heater. Note loop-seal overflow

regulating valve part way, restoring equilibrium. The same series of events could be started by a momentary drop in steam-supply pressure or sudden load change.

The larger the water-regulating valve, the more serious will be the effect. For example, assume that a valve is large enough to have a pressure drop of only 1 psi at full load flow. If heater pressure drops 2 psi suddenly, differential across the valve can reach 3 psi, momentarily increasing the flow about 70%. A smaller valve, having a full-load pressure drop of 5 psi would have its flow increased only 18% by a 2-psi steam-pressure drop, and would afford more stable operation.

A fairly safe rule-of-thumb calls for selecting the regulating valve of such size that its pressure drop at full heater load will be at least twice the expected maximum variation in steam pressure. If this results in so great a pressure drop that a surge tank at the highest possible location in the plant could not supply adequate head to supply the heater, either the steam-pressure controls should be improved to give closer pressure regulation or a different surge tank arrangement should be adopted.

Fig. 3 shows one method by which surge-tank elevation above the heater can be reduced. The arrangement follows Fig. 2 exactly except that the closed surge tank carries the same pressure as the heater. An equalizing line connects the steam space of the heater to the steam space of the surge tank.

Since the pressures above the water in both surge tank and heater are equal, the static head required above the heater need be sufficient only to overcome friction loss in the vent condenser, regulating valve and piping. The cost of such a surge tank will be greater than that of an open tank of equal volume, but this may be compensated by a reduction in structural costs because of the lower elevation.

The same controls should be used for this arrangement as for Fig. 2 and the same comments apply. A loop-seal overflow between the surge tank and the heater (as shown) permits the surge tank to overflow without loss of pressure and without waste of water until the heater also fills.

Transfer Pumps

If available headroom is insufficient for either of these arrangements, water must be pumped from surge tank to heater, Fig. 4. With this system, the tank can be located at any level. Makeup should be added to the surge tank exactly as in the gravity-feed systems but an emergency float-regulated makeup connection at the heater should be provided in event of pump failure. The float should be set at a low level in the heater storage compartment and a low-water alarm provided to indicate an interruption in normal water supply.

Water inlet to the heater is controlled by a regulating valve with a float set at the desired normal level in the heater storage compartment. This valve can have a fairly high full-load pressure drop as the total pumping power is relatively small and better regulation justifies the slight increase of head.

If used, the transfer pump should run continuously, throttled by the regulating valve. A small bypass back to the surge tank prevents overheating of the pump when the regulating valve approaches full shutoff. Start-and-stop control puts an irregular load on the heater and should never be used.

Reciprocating steam transfer pumps should be equipped with constant-pressure governors to hold steady pressure on the regulating valve. Pressure increase at light load would otherwise cause bad regulation.

A simple control for small units omits both regulating valve and constant-pressure governor. Instead, steam supply to the reciprocating pump is controlled by a valve operated by a float in the heater storage compartment. While this arrangement has the advantage of low cost and simplicity, regulation seldom equals that of the valve and governor combination.

While direct-contact heaters normally operate at positive pressure, it may be desirable to hold vacuum in the heater where all or part of the water is to be used in process at temperatures below 212 F or where heater steam is most economically obtainable at subatmospheric pressure.

Vacuum Operation

For vacuum operation, the vent can be piped to any point of lower pressure, usually the main condenser, or by equipping the heater with a small steam-jet air ejector. Ejector after-condensers use heater inlet water as a cooling medium, thus recovering heat from the ejector steam.

If a loop-seal overflow control is used, it must be able to hold seal over the entire pressure-vacuum range in which the heater operates and must also allow overflow when the heater is under maximum vacuum. A standard float-controlled overflow trap or valve can be used only if the trap or valve is far enough below the heater to provide a water leg that will create a positive pressure on the valve at all times regardless of the heater vacuum.

If space does not permit sufficient head on the overflow valve, an automatic vacuum breaker must be provided. It must open and break heater vacuum in synchronism with the operations of the overflow valve, best accomplished by using pilot-operated valves and connecting the vacuum breaker to the same float as the regulating valve.

These are the basic arrangements for direct-contact heater operation at constant pressure. Many modifications are possible because the heater is a flexible piece of apparatus which, with its associated tanks and piping, serves four fundamental purposes. It must heat the water, deaerate it, provide an emergency water supply and take up changes of volume in the water system. It can and will do all these things automatically and will be practically fool-proof in operation if the installation follows sound design principles.

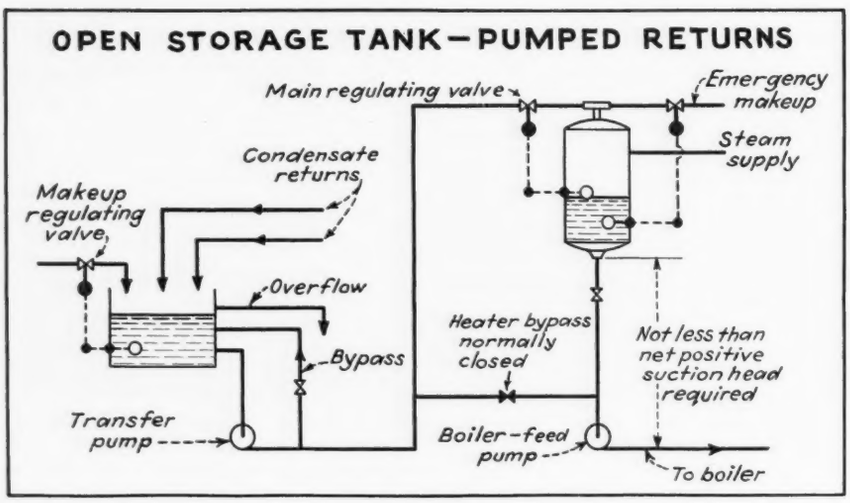


Fig. 4—Open surge tank can be located at any level if a transfer pump is provided; proper emergency makeup supply can be cut in automatically at low water level

Adjusting Speed to Suit Load Insures Efficient Operation

A F Hartung, Burns & McDonnell Engineering Co, compares methods of adjusting speed when only alternating-current power is available and shows power savings obtained when speed of centrifugal pumps and other loads are adjusted to suit output demand

► EVERY VARIABLE-SPEED DRIVE application presents a separate problem, and the factors affecting it must be analyzed in order to make the best selection possible. Here is a brief comparative study of variable-speed-drive characteristics which will assist the engineer in making such an analysis.

The factors usually considered include cost, speed range and ease of changing speed; over-all efficiency, weight and space requirements, motor power factor and starting current; available starting, running and pull-out torques, and special requirements, such as limitations of position, shock-absorbing ability, etc. The table compares some characteristics of frequently used variable-speed drives. Note that efficiency of slipring motors and hydraulic and electric couplings varies approximately as speed. Thus at 50% speed their efficiency will be approximately one-half, and at 25% speed, approximately one-fourth of maximum-speed efficiency.

The efficiency of other variable-speed devices does not vary greatly with reduced speed. In general, these drives have lower efficiency at high speeds than slipring motors, but have considerably higher efficiency when speeds are reduced appreciably.

Centrifugal-Pump Drives

Centrifugal-pump applications frequently require variable-speed drives; their power requirements vary approximately as the cube of speed. Fig. 1 shows typical curves at different speeds for a large centrifugal pump driven by a 720-rpm 0.80-pf synchronous motor through a hydraulic coupling. The pump delivers 17,500 gpm when operating at 325 ft head and 700 rpm.

Pressure on the system into which it discharges usually is held at 325 ft though there are times when it is desired to drop the pressure to 300 ft or lower. Because the system does not have any appreciable storage capacity, pump flow must be adjusted to fit demands.

With the pump running at 700 rpm and discharging 17,500 gpm against a 325-ft head, *A* on the curve, a 2.78% coupling slip results. At this point the pump output is 1635 hp, point *B*, while the motor output amounts to 1725 hp, point *C*, the difference being the coupling loss. If the system demand drops and requires only 10,000 gpm at 325-ft head, point *D*, the coupling output speed decreases to 625 rpm, or 87% of motor speed, and the pump requires 970 hp, point *E*, while the motor output will be 1150 hp, point *F*. Operating under these conditions results in a coupling slip of 13% and a coupling efficiency of 84.5%.

Although the hydraulic-coupling efficiency decreases because of the slip across it at this speed, considerable power can be saved by using the motor and hydraulic-coupling combination instead of a constant-speed pump with throttled discharge. If a 700-rpm constant-speed pump is used the power required from the motor with the pump delivering 10,000 gpm will be 1330 hp, as against 1150 hp with the hydraulic coupling, a saving of 180 hp. Even greater savings obtain when the system operates at 300 instead of 325-ft head.

In addition to saving power, a variable-speed drive eliminates vibration and throttling-valve maintenance troubles which must be expected with a constant-speed pump in this application.

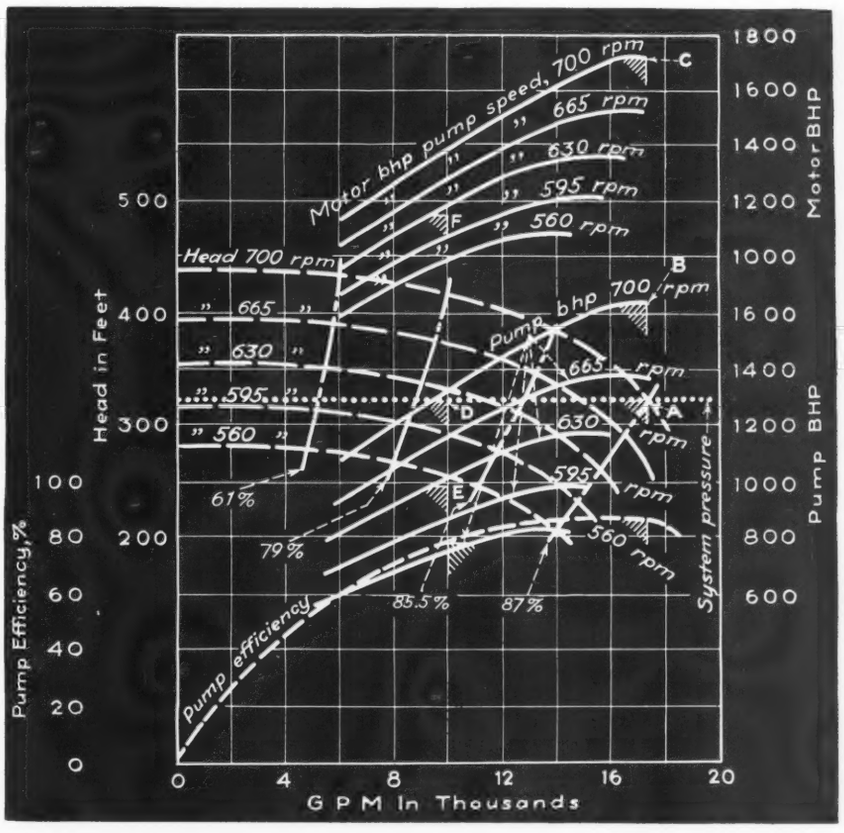


Fig. 1– Head-capacity, motor- and pump-power output and pump-efficiency curves for a large centrifugal pump synchronous-motor-driven through a hydraulic coupling

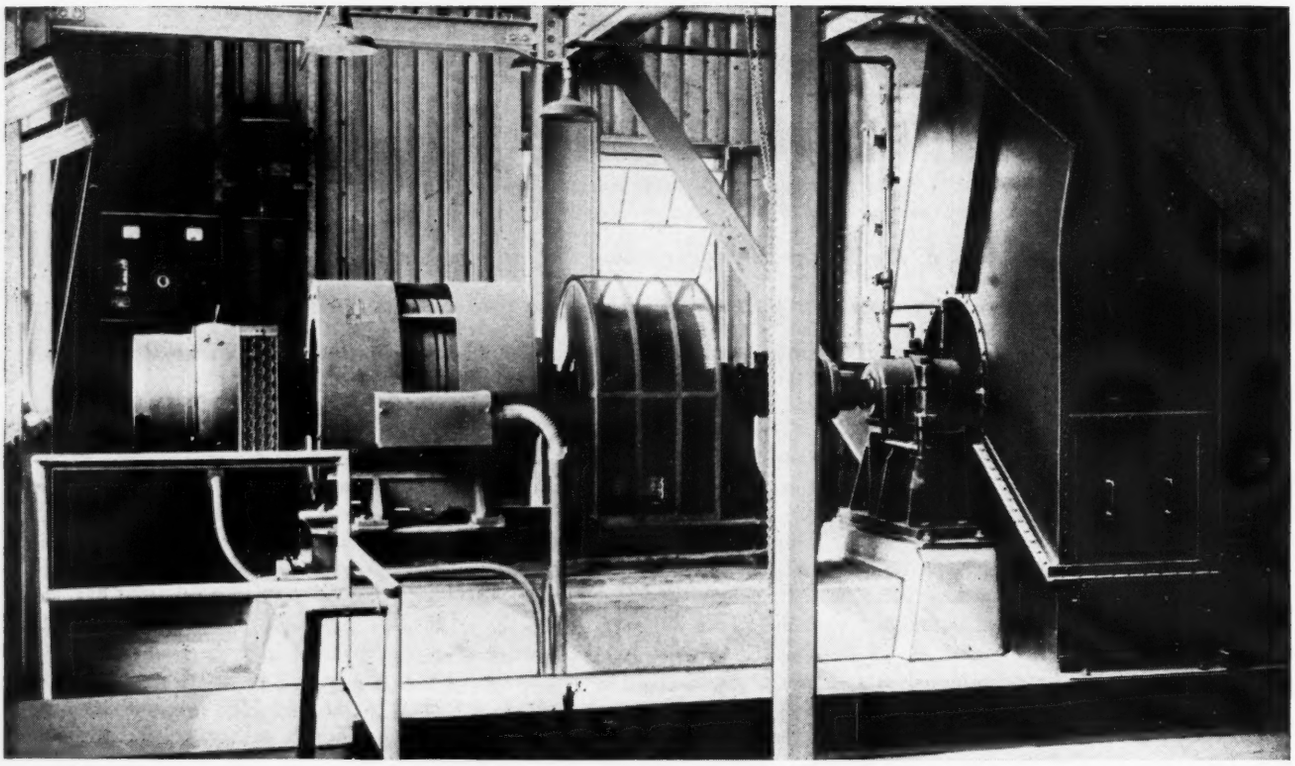


Fig. 2—A 250-hp 1200-rpm synchronous motor with direct-connected exciter drives a draft fan through a magnetic coupling

The characteristic curves are also approximately representative of a pump driven through an electric coupling, or of a pump driven by a slipring motor.

For constant-pressure pumping service it is seldom necessary to reduce the pump speed lower than 75%, and frequently not lower than 85% of maximum. In a recent application of a 300-hp pump for a municipal water-pumping system, a slipring motor with a 15% speed range proved most economical, both from the standpoint of first cost and operating cost. In this case, in which there was considerable reservoir capacity on the system, the pump discharged through a long pipe at two different heads. An eleven-point controller proved satisfactory for the application.

Variable-Speed Couplings

On pump applications using hydraulic or electric couplings for speed control, the drive should have a maximum slip of not more than 2% at full speed in order to attain a comparatively high efficiency.

In the case of forced- and induced-draft fans used with steam boilers, gas-pressure variation usually produces the necessary changes in air or gas flow through the boiler. Gas-pressure characteristics through most boilers vary as the square of the gas flow. Because of this, fan drives for boilers which must handle wide load swings should permit reducing the fan speed to 25% of maximum, using stepless control (or control with a large number of speed points, 75 or more).

Variable-speed units frequently drive such constant-torque equipment as plunger pumps and other positive-displacement pumps where a varying output is needed. Such pumps are used for boiler feeding, proportioning chemical flow, and similar applications, where output pressure is usually held approximately constant and flow is directly proportional to speed. For such applications a variable-speed drive eliminates bypass-valve troubles sometimes encountered with a constant-speed drive. The speed range for a constant-torque drive should be equal to the range in flow desired.

Any variable-speed drive can be used for constant-torque application, but use of slipring motors or hydraulic or electric couplings offers no power saving. These drives are torque transmitters rather than torque converters, and the power input for such applications will stay the same regardless of output

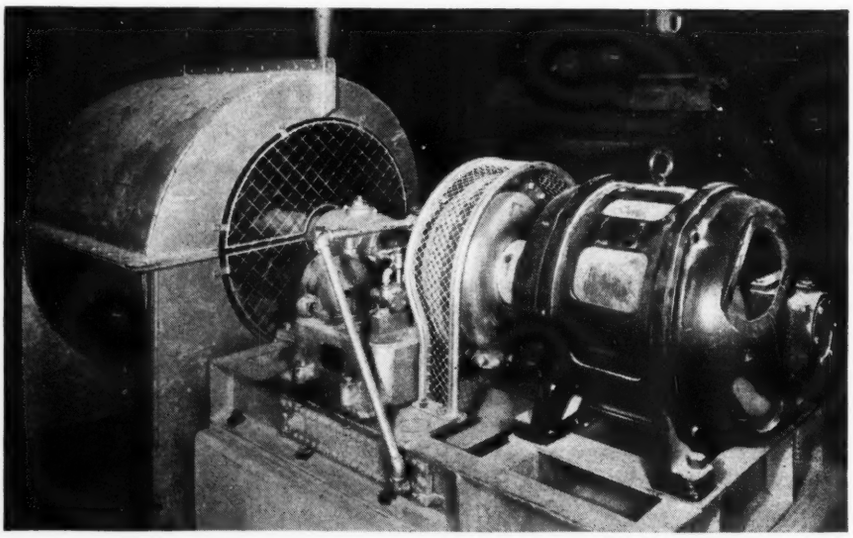


Fig. 3—Forced-draft fan driven by a constant-speed squirrel-cage motor through a hydraulic coupling to adjust fan speed over a wide range

speed. Slipring motors and hydraulic or electric couplings absorb power in direct proportion to the speed reduction across the unit. However, power savings can be realized if variable-ratio drives, brush-shifting motors, ac-dc drives, or regulator-controlled commutator motors are used. Multi-speed induction motors drive small reciprocating boiler-feed pumps successfully. Their use produces power savings and only a small automatic bypass is required to vary the flow between speed steps.

The importance of easy wide-range speed control, efficiency, simplicity, freedom from maintenance, ability to use synchronous motors, and other factors, must be weighed before choosing a variable-speed drive. In most applications at small horsepower ratings, ease of speed control and simplicity are most important, and efficiency and other factors secondary. For large horsepower applications, however, efficiency, as well as ability to utilize synchronous motors for power-factor improvement, are usually most important.

Slipring-Motor Drives

For most variable-torque applications in the smaller sizes requiring only a small amount of speed variation, the slipring motor makes the best choice both from the standpoint of initial and operating cost. The motor usually operates from a control which gives from 7 to 23 speed steps. Variable-ratio units, brush-shifting motors, ac-dc drives, or regulator-controlled commutator boxes will prove to be most economical if the unit operates considerably at reduced speed. Increased maintenance, however, sometimes offsets advantages gained.

Boiler fans usually require a wide range of speed variation without steps, in order to get the best operation from automatic combustion controls. Hydraulic or electric couplings are commonly applied today to such drives, although other methods are used successfully. Variable-ratio drives, brush-shifting motors, ac-dc drives, regulated electric couplings or induction-regulator-controlled commutator motors are required for variable-torque and constant-output-speed applications.

Comparison of Various Types of Speed-Changing Methods

Type of Drive	Capacities Normally Available	Starting Torque, %	Pull-Out Torque, %	Usual Speed Range	Efficiency, %		Power Factor, %	Starting Current % Full Load	Comments
					Full Speed	Reduced Speed			
Slipring motors	All sizes	200 to 225 or more	250 to 275 at full speed. Torque drops with speed	2 to 1	80 for small slow-speed units to 94 for large units	Varies as the speed	75 and less for small slow-speed units to 90 and better for large size. Power factor decreases with load.	150	Secondary-control equipment may require considerable space.
Constant-speed motor with hydraulic coupling (2% slip)	All sizes	Maximum torque of motor	Full motor pull-out torque	5 to 1	Coupling only 96½. [1]Over-all 87.	Varies as the speed	Determined by motor; unity or leading with synchronous motor drive.	Same as motor, 350 to 600. Motor started unloaded.	Must be installed horizontally. Usually requires a source of cooling water for oil cooler.
Constant-speed motor with electric-type coupling (2% slip)	All sizes	200 to 225 or more	250 to 275	5 to 1	Coupling only 90 for 1 hp to 96 for large sizes. [1] Over-all 81 to 86.	Varies as the speed	Determined by motor; unity or leading with synchronous motor drive.	Same as motor, 350 to 600. Motor started unloaded.	Must be installed horizontally. Requires a source of dc excitation.
Brush-shifting, adjustable-speed motors	0–50 hp usual sizes. Up to 1000 hp and larger can be obtained.	140 to 200	140 to 200 on low speeds. 300 or more on high speed.	4 to 1	82 to 94. Slightly lower than corresponding slipring motor.	Higher than slipring motor.	At full speed, approximately same as slipring motor. At low speed 50 to 62.	125 to 175	Requires commutator and brush maintenance.
Multispeed pole-changing motors	All sizes	200 to 225	250 to 275	2, 3, or 4 speeds with 3 to 1 range.	80 to 94	Usually slightly less than equivalent squirrel-cage motor.	High speeds same as squirrel-cage motors, low speeds somewhat less.	Low on low speeds	Speed must be changed in steps corresponding to pole connection.
Motor-generator unit with dc motor	All sizes	600 at minimum speed setting	Depends on speed setting	10 to 1	60 to 70	Remains high	Determined by motor, unity or leading with synchronous motor drive.	350 to 600	Requires commutator and brush maintenance. Regenerative braking and reversing can be obtained.

[1] Over-all efficiency is based on a 90% driving-motor efficiency.

Turbine-Electric Ships

Aviation gasoline and fuel-oil requirements of almost the entire world will be carried in fast turbine-electric ships. War Shipping Administration calls for men with steam-electric generating experience who hold marine-engineer licenses or certificates of qualification as ship engineers

Official Maritime Commission Photos

Each of these standardized tankers carries over 130,000 bbl of petroleum products

▶ To get large-horsepower ship propulsion without adding to demands on gear-cutting shops, new tankers have a single-screw electric-motor drive. Carrying more than 5,000,000 gal each trip, these fast tankers will help to relieve oil shortage in whatever part of the world they are sent.

War Shipping Administration needs men with steam-electrical experience to man engine and boiler rooms of tankers such as these. First call, of course, is for men who already hold licenses as marine engineers or certificates as qualified members of the engine department. Provisions for training stationary engineers without sea papers have not yet been worked out, although the need for such men is recognized and will become critical in the future.

Typical tankers are 503-ft long by 68-ft beam. They are high-quality ships comparable in every way with dry-cargo ships of the Maritime Commission's long range program. Fitted out to the last detail with forced ventilation of machinery spaces, steam-heated living quarters and hot showers, the ships' bill of materials even includes such items as upholstered furniture, bookcases, file cabinets, medical supplies and mirrors. Galley carries refrigerated stores, electric water heating and refrigeration. Cooking and baking are done by electric range and oven.

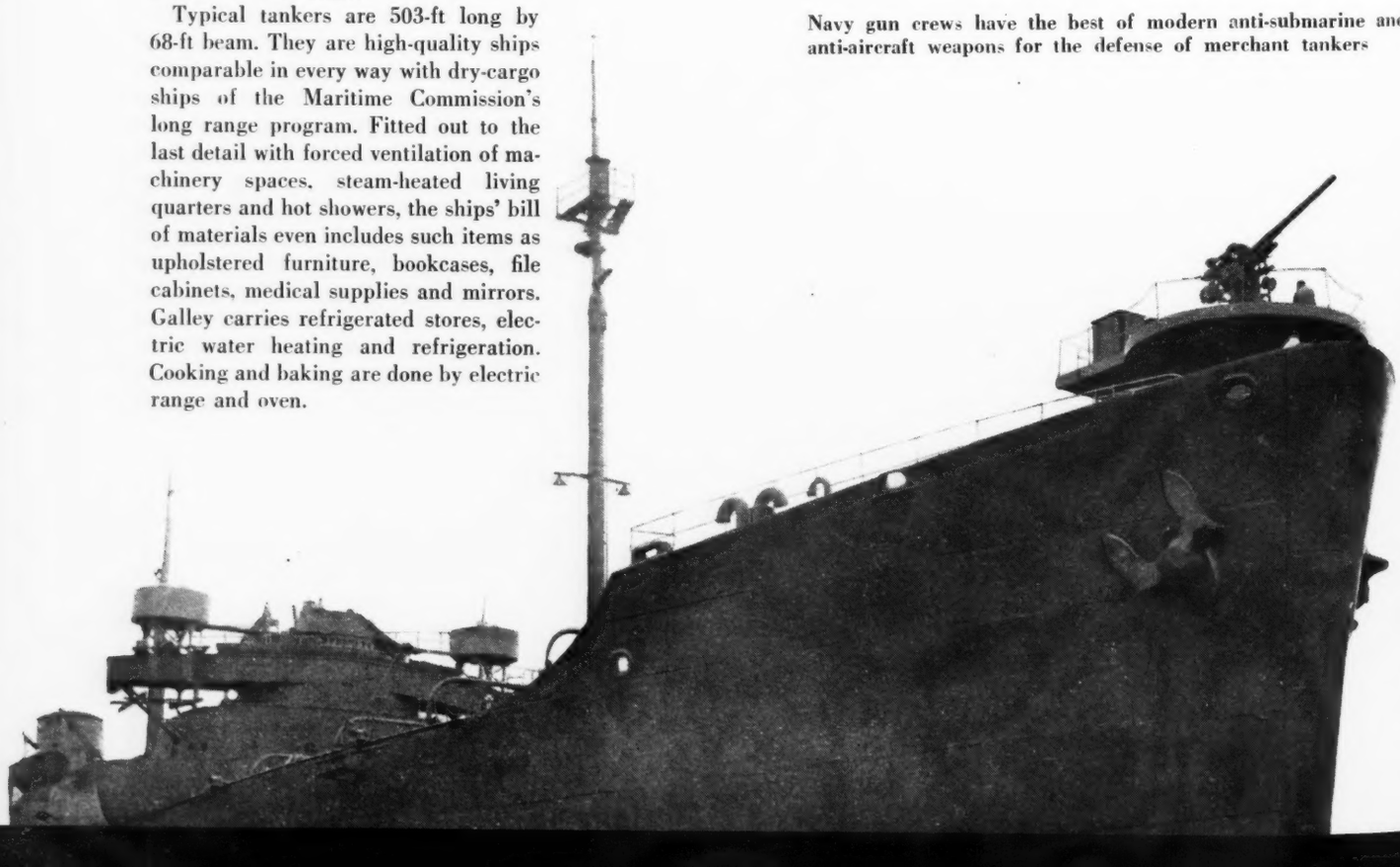
In the engine department, steam is generated in two 435-psi 720-F oil-fired boilers of watertube sinuous-header construction with water-cooled walls and air preheaters. Each boiler is fired by four standard mechanical-atomizing burners with insulated cover plates arranged in double-front construction. Combustion control, soot blowers, feed-regulator, gage glasses, instruments and smoke indicator all equal best land equipment.

One motor-driven forced-draft fan supplies each boiler with air for combustion. An additional unit serves as standby. Boiler and engine rooms each have a suitable ventilating fan.

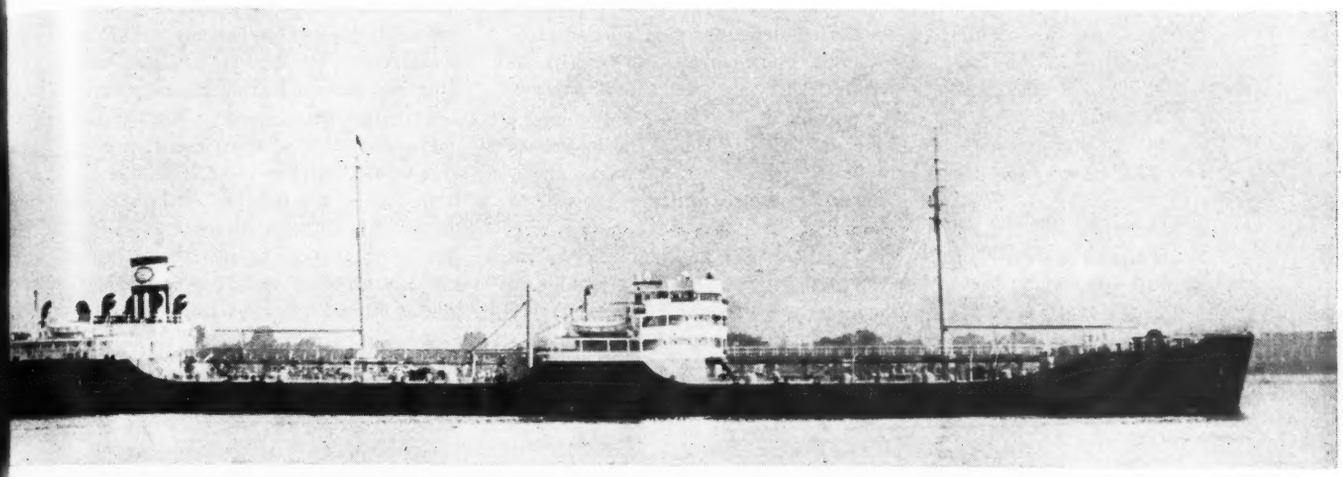
The prime mover, a single 3720-rpm main turbine-generator, runs at variable frequency up to 62 cycles to drive a single 2300-volt 3-phase motor. A 2-pass surface condenser maintains a 28¼-in. vacuum with 80-F seawater passing through ¾-in. Admiralty tubes rolled at both ends. The steel condenser shell has an expansion joint; cast-iron water boxes are Apexior coated inside. A 2-stage steam-jet provides air removal.

Two 525-kw auxiliary generating sets supply 450-volt 3-phase power for fans, pumps and lighting. In addition to three 2000-gpm 200-hp motor-driven main cargo pumps and two cargo-stripping pumps, these ships have the usual complement of boiler-feed, condensate, circulating, bilge, evaporator-feed, fire, fresh- and salt-water service, lubricating and fuel-oil pumps. Centrifugal pumps,

Navy gun crews have the best of modern anti-submarine and anti-aircraft weapons for the defense of merchant tankers



Speed Oil to Mechanized Armies



Many of these ships already wear the lead-gray paint of war service in the supply line to fighting forces on land, sea and air

both horizontal and vertical, are motor driven while auxiliary and emergency reciprocating pumps are steam drive.

Lubricating-oil system includes a 300-gph centrifuge with steam heater, 500-gal storage tanks and 600-gal drain tank. Two oil coolers serve the lubrication system.

Fuel-oil storage tanks are equipped with bunker-heating grids fabricated from 1½-in. pipe bends in the ratio of one sq ft to 80 sq ft of tank volume. In addition a heater coil is located at each suction pipe. A coil heater supplies preheat up to 250 F to the burner lines.

Other engine-room equipment includes a cartridge-type desuperheater for reducing temperature of 28,000 lb per hr of steam from 765 to 500 F using 300-F feedwater. A 3-ton Freon refrigerating plant serves galley stores and drinking-water lines. A 30-cu-ft air receiver supplies reservoir capacity for a 52-cfm compressor. The evaporator system can handle 40 tons of raw fresh water per 24-hr day or half as much raw salt water. A direct-contact deaerating heater with attached storage tank supplies one of the two stages of feedwater heating which bring feedwater to 300 F.

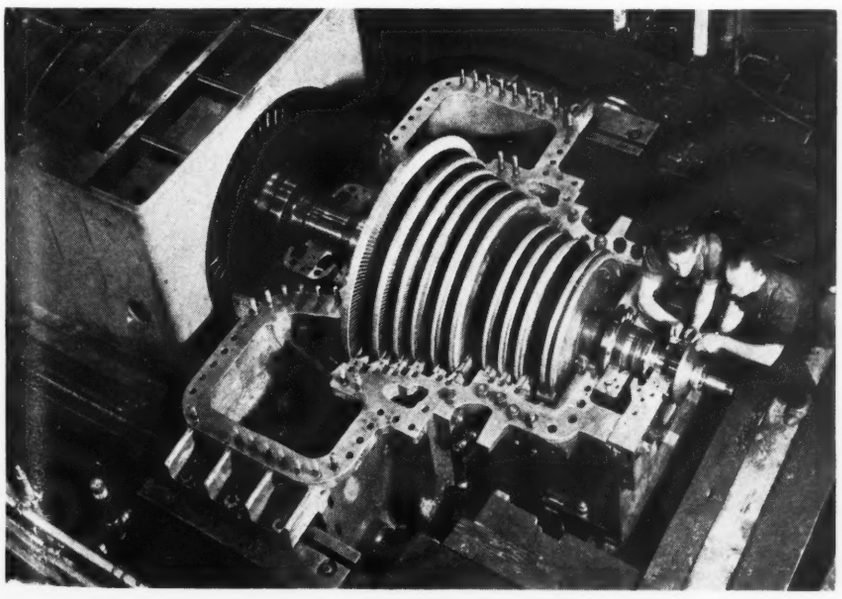
Main generator has a closed ventilating system. Main propulsion motor also has separate air coolers and an external ventilating fan. Separate windings provide for synchronous-motor operation at cruising speeds, with varying frequency up to 62 cycles, and induction-motor operation during maneuvering. Control cubicle contains air-break reversing and field-circuit switches.

Two 400-kw auxiliary turbine-generator sets supply 440-volt 3-phase power for pumps and auxiliaries. All motors over ½ hp are 440-volt machines. A 75-kw unit furnishes excitation for the main propulsion units and a 50-kw machine supplies the auxiliary sets.

Three 200-kva 2300/450-volt transformers step down power from the main generator for cargo pumping while in port. Lighting and small power can also be supplied by a shore connection at either 440 or 120 volts, interlocked to guard against dual simultaneous connection. Three 15-kva 440/120-volt transformers supply normal lighting, telegraph alarms and small power. A 50-kw port turbine-generating set can operate on steam pressure conditions as low as 75 psi with 10% moisture, from the shore connection.

Machine shop equipment includes an 18x102-in. 12-ft-bed lathe, a power drill capable of 1¼-in. holes, a 16-in. shaper and a floor grinder with two 12-in. wheels. Five pipe vises distributed throughout the ship can handle up to 6-in. pipe. Other accommodations are afforded by a paint locker and boiler-water test room with necessary sample cooler and connections.

Fire-hose connections spaced 50 ft apart can use 2½-in. or 1½-in. hose. In addition, a steam-smothering system



Turbine-generator turns out variable-frequency 2300-volt 3-phase power up to 62 cycles using 435-psi 720-F steam from two oil-fired boilers *General Electric Photo*

is piped to all cargo spaces. Grouped CO_2 cylinders released by remote manual control from either of two control stations protect engine-room and boiler-room bilge spaces.

Miscellaneous engine-room equipment includes a 450-gpm 200-F hot-water tank-cleaning system and handling gear for main machinery. An 8-ton trolley carriage hoist serves the main turbine unit and a 2-ton hoist the auxiliary generating sets.

Deck gear is electrically driven. Windlass can raise both anchors together from 30 fathoms at 30 fpm. Steering gear is electric hydraulic.

Experienced Men Wanted

In recruiting engineers with steam-electric background ashore for service on electric-drive tankers, the Recruitment and Manning Organization (RMO) of the War Shipping Administration now calls for men with marine licenses as chief, first, second and third assistant engineers and others who hold certificates of qualification as members of the engine department. RMO works through existing agencies such as merchant marine training stations of the War Shipping Administration, union hiring halls, personnel departments of shipping companies and the United States Employment Service. In addition RMO officers are maintained in principal seaports and Port Officers stationed in other large cities to assist in efficient movement of qualified men to the merchant marine.

Training schools limit age of enrollees to men between 18 and 35. Twelve such schools are now in operation on both coasts. Men are paid while in school as well as on training cruises aboard ship.

Three questions most often asked RMO officers are (1) what protection is afforded dependents of marine engineers (2) how soon will services be required and (3) what actual pay can be expected of the somewhat complex wage-and-bonus system. In answer to the first, $5000 in war risk insurance is paid for by the Government payable to dependents if death or complete disability occurs as a result of war operations. Additional war risk insurance of the same type can be purchased at $10 per month per $1000. Private companies also sell standard life insurance at $50 per year per $1000 above the normal premium rate. Compensation for loss of personal effects ranges from $100 to $500, depending on the individual's position aboard ship and the extent of actual loss.

Qualified men (with licenses or certificates) are in demand and can usually ship as soon as they have settled affairs at their present employment. RMO personnel cooperate in aiding individual adjustments with previous employers and allow time for the transition.

Base pay scales of qualified members of the engine department start at about $100 a month and range up to more than $400 a month for chief engineers. In addition, voyage bonuses range from 40% to 100% of base pay, the high bonus limit applying at present to practically all trans-Atlantic, trans-Pacific, Latin-American, Gulf and Caribbean voyages. Port bonuses amounting to $60-125 are also paid for calls within specified areas, the high limit applying to USSR, British, Suez, Indian, Far East and Australian ports. Base pay continues throughout a period of internment or capture by enemy or if the vessel has to be abandoned until repatriation to a United States port.

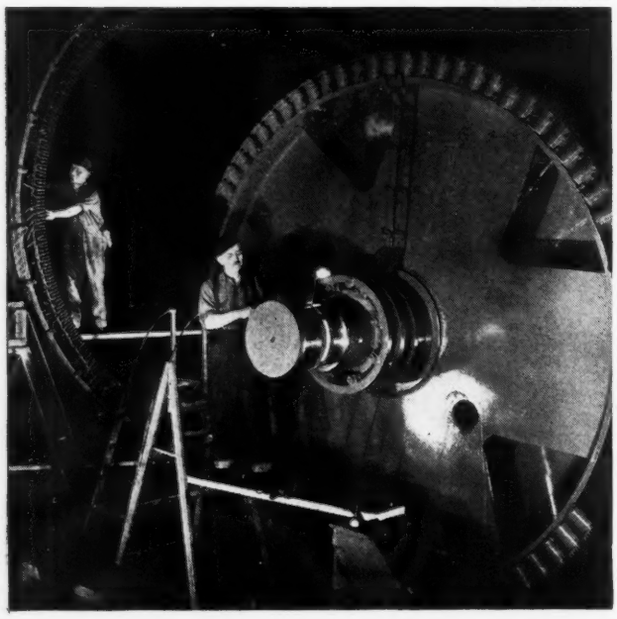
The immediate need is for licensed men with rating of third assistant engineer or higher. For these, red tape has been cut to a minimum. On reporting to an RMO office in person or by letter, they are registered as available at whatever future time suits the convenience of the individual. They are referred to Coast Guard Merchant Marine Inspection Service for interview.

Certificates Required

Certificates of qualifications as members of the engine department, required for pumpman and deck engineer, can be obtained without previous sea experience, by examination. Similar certificates for oiler, water tender and fireman are not granted without previous sea experience.

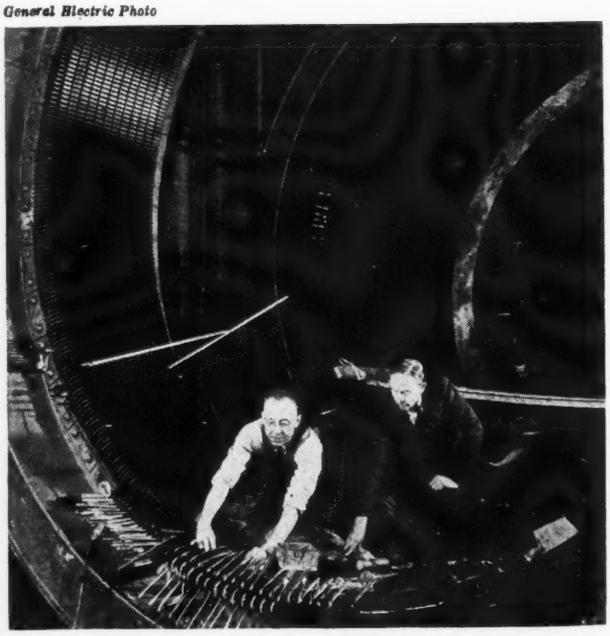
However, construction of ships is being carried out at a faster rate than early plans for recruiting could have foreseen. Whether the critical period of shortage of engineers and crew occurs in one month or six depends on future construction rates, losses at sea and the number of licensed personnel that can be returned to sea duty. Undoubtedly some further relaxation in rules will receive consideration when manpower supplies under present regulations begin to endanger full utilization of ships.

Westinghouse Photo



Stator and 30-ton rotor of synchronous motor for single-screw tanker. Motor has induction winding for maneuvering

General Electric Photo



Electric drive eliminates need for hard-to-get gears so that more ships will be ready quicker

The Old Chief

24—The Precious Indicator

Another in the series by William Doran, chief engineer, Essex County Sanatorium, Windsor, Ontario. Writing of the inspiration of the past, he has captured much of the human side of engineering

▶ NOT SO LONG AGO I was talking to a stationary engineer. He was a grown man, with hair on his face and a certificate on the wall. I asked him if he had ever used an indicator and *he admitted that he had never even read about one.* In case there are two such people around I would like to state, for the benefit of the other fellow, that an indicator is an instrument used by engineers to record just what takes place in the engine cylinder, and to check valve settings. The indicator diagram produced is a graph of the steam pressure and of the position of the piston in the cylinder.

The one used by the Old Chief was 15 years old when I first saw it and it was without blemish or mark. It was a Kelvin type with outside springs. The hardwood box in which it was housed was of equal workmanship to that of the instrument itself. The Old Chief would always clean and pack it away with his own hands. So great a store did he set upon the indicator that the engineers often referred to it as "The Holy Grail" or the "Crown Jewels."

Indicator Buster

One day the Old Chief emerged from his office with one eyebrow lifted, as if he were not sure of his own judgment. He inquired if I could leave the plant for a little while, explaining that Pete Hossik, the chief at the Electric Railway Power House, had broken something on his indicator and had asked for a loan of ours. He added that he wanted me to accompany him to make sure they did not break ours as well. "It's my opinion," he continued, "that any man who could bust an indicator could also be guilty of murdering his own grandmother." Our destination was a nearby town, so we caught the trolley car and on the way down the Old Chief explained that their plant consisted of two Goldie-McCulloch cross-compound engines and an older standby engine.

Vertical Tandem Job

I may say that this particular Electric Railway Company ran through four semi-suburban towns and like a hundred and one other small companies of its kind, it was born in boom times, was convalescent in ordinary times and died a painless death at the hands of the busses in depression times. I don't think that anyone ever missed its square wheels or poor service.

When we arrived at the plant their Chief was not available, so we had time to look around. The standby engine immediately took my eye, it was the first vertical tandem job I had ever seen. It took up a very small amount of floor space, and both the h-p and l-p pistons were on the same shaft. We ran diagrams off this job first and soon had her balanced. I noticed poor compression at the lower end of the l-p cylinder, which did not surprise Mr Hossik or the Old Chief in the least. When we had corrected the setting of the "Goldies" we had about half an hour to wait for the next trolley; while the older men talked I had a look around the boiler room. The engine was no great shakes as far as housekeeping was concerned, but that boiler room was the most mouldy, decrepit, motheaten place I ever saw.

When you looked aloft, you noticed a dozen places where the covering had been torn off to facilitate repairs; in each case the covering had not been replaced and the torn duck hung down like weeping willow. Several of the hangers had "let go", probably caused by broken bolts or pulled anchors. The sag in the line was noticeable, but no attempt had been made to repair the damage. I was amused to notice the body of an old 6-in. gate valve which lay directly below where it had been replaced. It lay in the passage way and must have been swept around and stepped over for months until it became an island of dirt in a dirty passage. The bench was piled with junk and ornamented with half empty grease cans and leaking oil cans. A tunnel leading to the car barns was a monument to twenty years of built up untidiness and disorder.

Politics, Maybe

On the way back I asked the Old Chief if the working conditions were the cause of the trouble, but he informed me that hours, wages and number of staff were above the average for the district. "Politics may have something to do with it; no one can be hired or fired unless the big man says so, but," he added, warming up to the subject, "The blame lies with the men who work there. They figure that no one would think it *important* if they cleaned up the place, they figure that it would make no *important* change in the efficiency of the plant. But darn their hides, their self-respect would be boosted 50% if they cleaned the place, and that, sir, is IMPORTANT".

War Means Your Refrigerating System Must Produce More "Cold"

With new refrigerating equipment going into war service, existing systems must carry more load and do it economically and reliably. Here are practical pointers on boosting capacity and improving operation

By TERRY MITCHELL, M.E.
The Frick Co, Waynesboro, Pa.

► DISEASE KILLED more American soldiers in the Spanish War than did bullets. By 1917 we had learned to protect the health of our troops; wide use of refrigeration, especially for keeping foods fresh and wholesome, played an important part. In the present conflict thousands of refrigerating machines do war service, not only in army cantonments, naval bases, ships, hospitals and arsenals, but in many kinds of chemical plants, airplane and munitions factories, test laboratories and quick-freezing plants.

That, briefly, is the reason why the refrigerating systems already installed in food factories, ice and cold-storage plants, hotels, restaurants, office buildings and institutions are now called on to carry the heavier loads that go with war—without the aid of much new equipment. The engineer who succeeds in making old machinery do a better cooling job, more dependably, serves his country just as surely as the man in uniform.

Just how can a half-worn-out system be made to produce more "cold" than ever, and do it dependably? There are often more ways than one to improve performance; records show that bringing operation up to date produces amazing results in plants 20-30 years old.

Constant Recirculation

In making changes to a refrigerating system remember that it works on the principle of constant recirculation. The compressor may be called the heart of the system and pumping refrigerant may be compared with circulation of blood in a living body. Any major alteration to one part of the system affects operation of the other parts.

To do a good job, all the parts must be "balanced." Most plants have one or two weak spots which limit over-all performance. Coils or coolers may be unable to take up heat rapidly enough; wasteful clearance, poor valve action or low suction pressure may be robbing compressor efficiency; condensing pressure may run too high; or unseen leaks may be draining the plant's life blood.

Let's look into these problems further; for example, heat transfer and its effect on suction pressure. A glance at an ammonia or Freon-12 table will show that as temperature goes down, refrigerant pressure goes down with it. When an inexperienced operator wants more "cold" he often pinches off the expansion valves a little farther, dropping the temperature. But if he really wants to make the system carry a bigger load, he must find means to increase the suction pressure, not reduce it!

Capacity of a refrigerating machine increases rapidly as suction pressure is

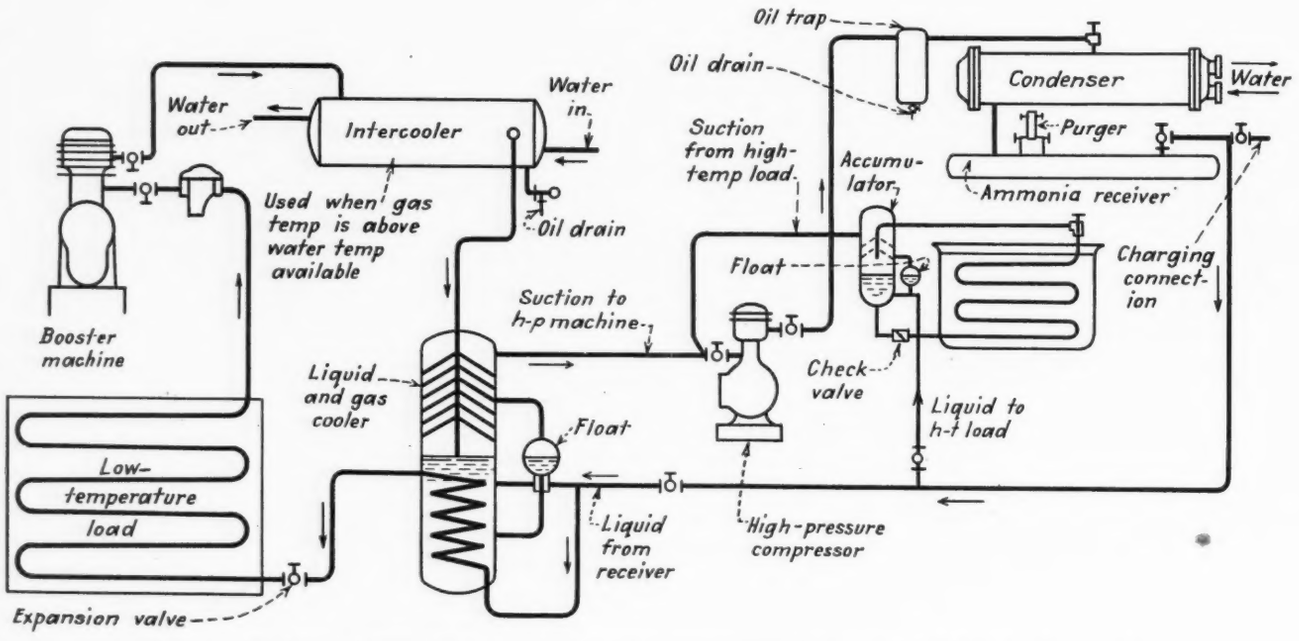


Fig. 1—A modern refrigeration system, with booster compressor, intercooler, and liquid-and-gas cooler

raised; its cylinders can pump more gas. An ammonia machine running at 22 psi suction pressure will do twice as much work as one running at 5 psi. An increase in suction pressure of 1 psi means a gain in capacity of from 2 to 5.5% or more, depending on the refrigerant and the pressures. And the horsepower needed to produce each ton of refrigeration goes down so fast with higher suction pressure that important power savings can be made. For example, a machine producing 25 tons with 66.5 hp at 0 psi suction pressure can turn out 38.5 additional tons with only 27.5 more horsepower at 20 psi.

Improve Heat Transfer

To do more work without being any colder, the coils or coolers must have the best possible chance to transfer the heat to the refrigerant. Old-time coils had several bad design features. They were strung out in such long lengths that a serious drop in pressure, amounting to as much as 5 psi, sometimes occurred before the suction gas reached the machine. The inside walls were operated too nearly dry and the outside was either too heavily frosted or the flow of air or liquid over it was too slow.

A pipe or tube will transfer many times as much heat if it is kept "flooded" with liquid so that the inside walls are always wet. If velocity of flow of air or liquid over the outside surface is increased and if the walls are clean, the heat transfer goes up in proportion. The same coil that with natural air circulation gave a heat-transfer rate of 2-3 Btu per sq ft, per F, per hr can be made to transfer up to 18 Btu under the right conditions, with forced-air motion.

Keep Frost Off Coils

Keep excessive frost off coils. Brush it away before it becomes solid, wash it away with water or brine, chop it off, or melt it off with hot gas inside the coils. Machines under automatic control can often be made to stop long enough, periodically, for the frost to drip off. Keep thick layers of rust from choking down the heat transfer from your room coils; clean and paint the pipes. Blow scale and oil from the inside of ammonia pipes with hot air or steam. If steam is used, dry the coils with hot air.

Install float valves, thermal expansion valves, accumulators or liquid-circulating pumps to keep coils or coolers flooded. Add fans, agitators, or pumps to increase circulation of air or liquid to be cooled. Or put in more evaporation surface, even if it has to be second-hand pipe. In a general cold storage, for example, it may take from 2.5 to 3.5 times as much direct expansion piping to handle the load at 30 psi suction as at 10-psi. With brine piping it takes up to 4.5 times as much. These figures apply to coils without forced-air circulation.

Call in a refrigerating engineer and a welder; see whether they can break up the long coils into more efficient short ones, joined in groups to headers. Make sure that the headers, particularly those handling liquid, are of ample size. Build bunkers or ducts (wooden ones will do all right) to direct flow of cold air over the coils instead of leaving this to chance. Similar ducts can be used to concentrate the moving cold air on goods to be chilled or frozen. But watch out for dehydration if the product is not well wrapped or the air is not cold enough to freeze the surface quickly.

Another way to make evaporators do more work is to make sure the liquid ammonia or Freon-12 fed to them is already good and cold. A coil inside the accumulator or, better, in a separate liquid precooler (see Fig. 1) can chill the refrigerant to a point well below the condensing-water temperature. This precooling work can be done best at a higher suction pressure by a special compressor assigned to such duty. The same type of machine may be used to precool water before it goes into ice cans, to precool milk or foods to be quick frozen. It will take out many a Btu that represents unnecessary load on the low-temperature coils.

Remember that the banks of closely spaced coils used for cooling water in tanks must be kept fairly free of ice between the rows of pipes or their effective surface will be greatly reduced. Water flowing rapidly in counter-current fashion over a few flooded coils cools more easily than water flowing sluggishly over great banks of spiral pipes frozen inside a solid block of ice. Remember also that the coils in a tank for cooling water by natural circulation (as in a milk-cooling plant) should run along the bottom of the tank if the

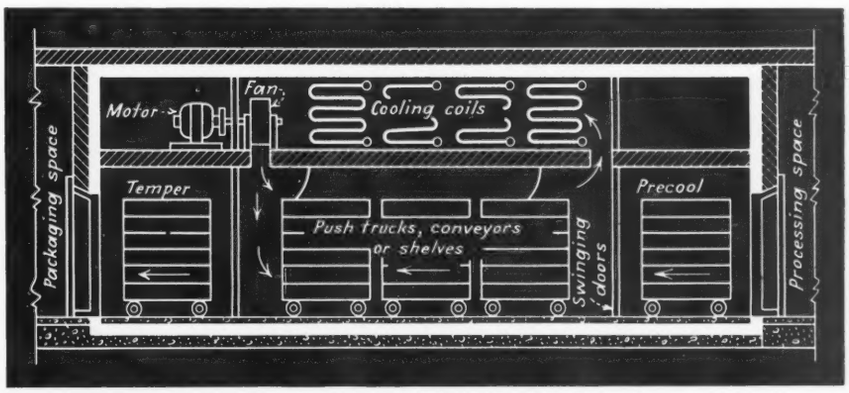


Fig. 2—Skillful arrangement gets most work out of cooling coils and freezing rooms

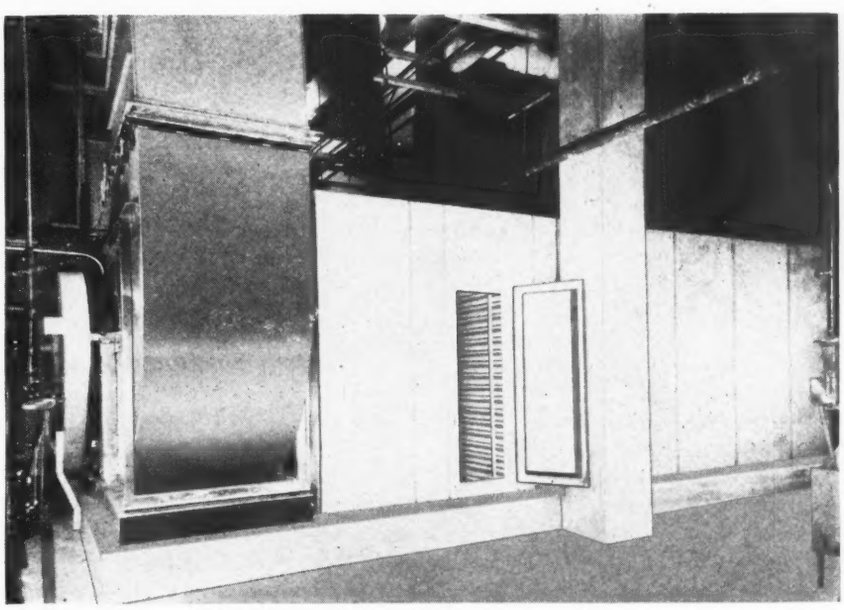


Fig. 3—Increasing rate of air movement over cooling coils, by use of fan and ducts, steps up heat transfer and so makes a given amount of cooling surface do more work

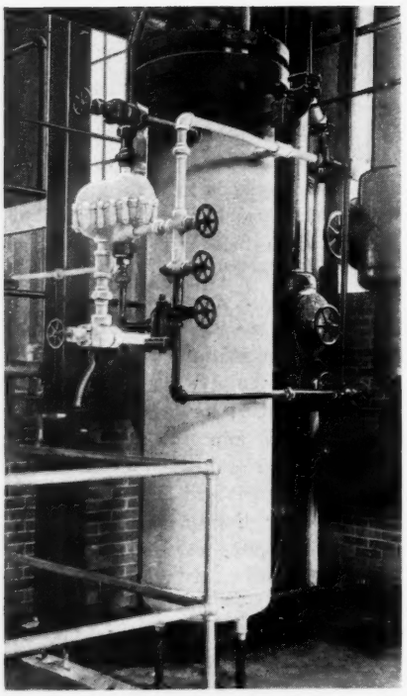


Fig. 4—An accumulator, like that pictured above, insures "flooded" coils and better heat transfer

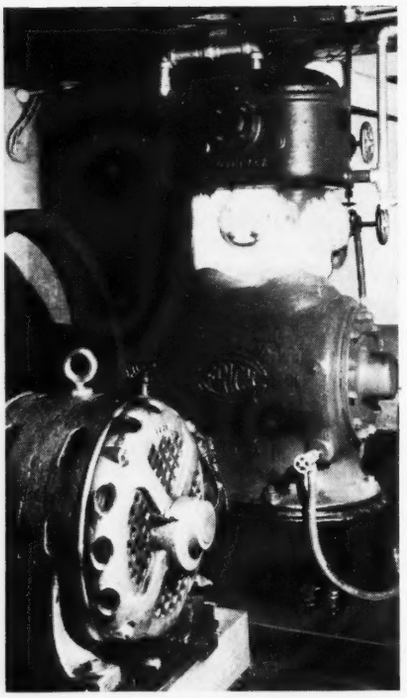


Fig. 5—Liquid-and-gas coolers lower temperature of liquid refrigerant and remove superheat from booster discharge

water is to be chilled below about 36 F. The warmer water sinks after this temperature is reached.

Water-soaked insulation may be overloading your coolers; damp or ice-packed insulation is almost as bad as none at all. The pressure of the moisture in the outside air, which is really a form of steam, tends to force water into the insulation and on into the cold space, where moisture freezing out on the coils keeps the vapor pressure down. The pressure of invisible vapor is a powerful thing; it will go through many waterproof materials or coatings. Dry out your rooms when not in use. Keep after "leaks" in the insulation just as you keep after ammonia leaks.

Cut Discharge Pressure

After doing all you can to raise the suction pressure, while still holding required temperatures, look to the discharge pressure. Inadequacy more often lies in the condensers than in the compressors connected to them. Remember the condenser must handle both the heat collected by the suction gas and the heat of compression in the machine, which last equals 2545 Btu per hr for each horsepower expended on the compressor by the driving unit. At 20 psi suction, each 10 psi of extra head pressure will cut back the capacity of an ammonia machine about 1% and will raise the motor load about 3%.

Excessive head pressure throws an extra strain on the moving parts of the compressor, especially on the discharge valves, and indeed on all the high-side equipment. As condenser temperature goes up, the liquid ammonia becomes warmer. Under extremely high discharge pressures the non-condensible gases in the system expand, rust and scale are encouraged to build up in the condenser tubes, and oil may even burn on the valves of the machine.

Old-fashioned condensers, particularly of the atmospheric drip type, are likely to become bottled-up with liquid ammonia. In one case, some of the stands in a bank of these condensers held so much of the ammonia that there was not enough liquid in the receiver to maintain a seal, and gas was fed to the expansion valves at intervals. Complicated "drip" arrangements of the piping on atmospheric condensers are often better done away with, in favor of straight flow of gas into, and liquid out of, the stands.

With shell-and-tube condensers, local conditions may require from 5 to 15 sq ft of tube surface per ton of refrigeration for the vertical open type and 4 to 16 sq ft for the closed (multipass) type, in which higher water velocities are attained. Average values used in good practice run from 7 to 10 sq ft per ton.

Vertical shell condensers can often be made to carry overloads by running more water through them. If you cannot buy additional shells and must have more surface, consider running water over the *outside* of the shells as well as through the tubes. The cooling surface available in the shell is often 25 to 35% of that in the tubes. Troughs, slotted pipes or sprays can be installed to spread the cooling water over the shells, which should be given a good coat of paint. Arrangements for collecting the water must be designed to suit each case. Remember that location has a lot to do with condenser performance. Many a shell condenser blistering in the summer sun could be shaded by a roof or a group of trees, with consequent "shading" of the power bill. Metal surfaces exposed to the direct rays of the sun will absorb an astonishing amount of heat.

Another means of bringing down condenser temperature and thus cutting head pressure is to install more cooling-tower capacity. If you can't buy a tower, a fairly efficient unit can be made by a carpenter, using wood and galvanized "hog wire", sometimes called hardware cloth. The wire, of ¼-in. mesh, is stretched across the tower at one-foot, or greater, intervals, to break up the water as it falls from above. The open mesh permits the warm air to rise through the tower. Fans can be installed at the base if wanted—and if obtainable—but they are not necessary if the tower is made large enough. Allow one sq ft of wire area, on any level, per gal of water, in warm climates. To lower water temperature 5 F, circulate 6-10 gpm of water for each ton of refrigeration. Spray ponds may average 7-10 gpm for 4 F cooling.

Purging Equipment

Most Freon-12 systems, and too many ammonia plants, run at excessive head pressure for want of a purger. Hand methods of blowing out air and other non-condensible gases are troublesome and uncertain and always tend to waste refrigerant. Hence the engineer hesitates to purge the system as often as it should be done. Modern purgers will materially lower head pressure without appreciable loss of refrigerant and can be operated a few hours each week, while the plant is running. It is not uncommon to bring pressure down 15-30 psi by eliminating all the air from the system; the condensing temperature comes down at the same time. Whatever the cause, 30 psi extra head pressure means 33% more hp per ton and 10% less capacity in a Freon-12 system. Yet how many air-conditioning systems have purgers?

Many a compressor built 20 or more years ago can be made to do more cooling by fitting it with improved valves, such as the multiple ring-plate type, and increasing its speed. Check the engineering details with the manu-

facturer; find out whether forced-feed lubrication can be applied, what speed the flywheel will stand safely, and how much the rods and bearings can be loaded. Horizontal compressors with long strokes reach top speeds more quickly than vertical machines. Pipe connections on old compressors are often too small; consider enlarging both suction and discharge lines if machine is to run faster.

Test Clearance

Test the clearance of horizontal machines by careful measurements or by placing a slug of soft lead or solder between the piston and head while the wheel is turned over by hand. Unnecessary clearance is a direct waste; the gas on re-expanding keeps the suction valves from opening soon enough, the cylinder heats up, and power is wasted. Horizontal machines should have more clearance at the head end of the cylinder than at the crank end, to allow for the lengthening of the piston rod as it becomes warm.

Automatic controls such as thermostats, thermal expansion and float valves and solenoid shutoff valves can be applied to make the plant run more efficiently than under manual control. They keep the liquid feed more constant and in better balance with the load. They stop the machine when it is not needed. Automatic unloaders permit rows of large machines to be started by pushbutton. Capacity controls are useful in balancing the load but it should be borne in mind that when clearance pockets are open the power required to produce a ton of refrigeration is increased 1.5 to 5% above normal.

Steady operation is a big factor in saving power. Refrigerating machines are rated on the basis of continuous 24-hr service; they cannot be forced to carry their full load in any less time. During shutdown periods the entire plant, including the insulation, goods, brine, etc. absorbs heat. It is more economical to operate one compressor at high suction pressure, continuously, than to run two machines at low temperature in the daytime only, in an effort to catch up with the load and to store up "cold". In moderate weather, the size of the motor pulley may be changed to permit steady operation at high suction pressure.

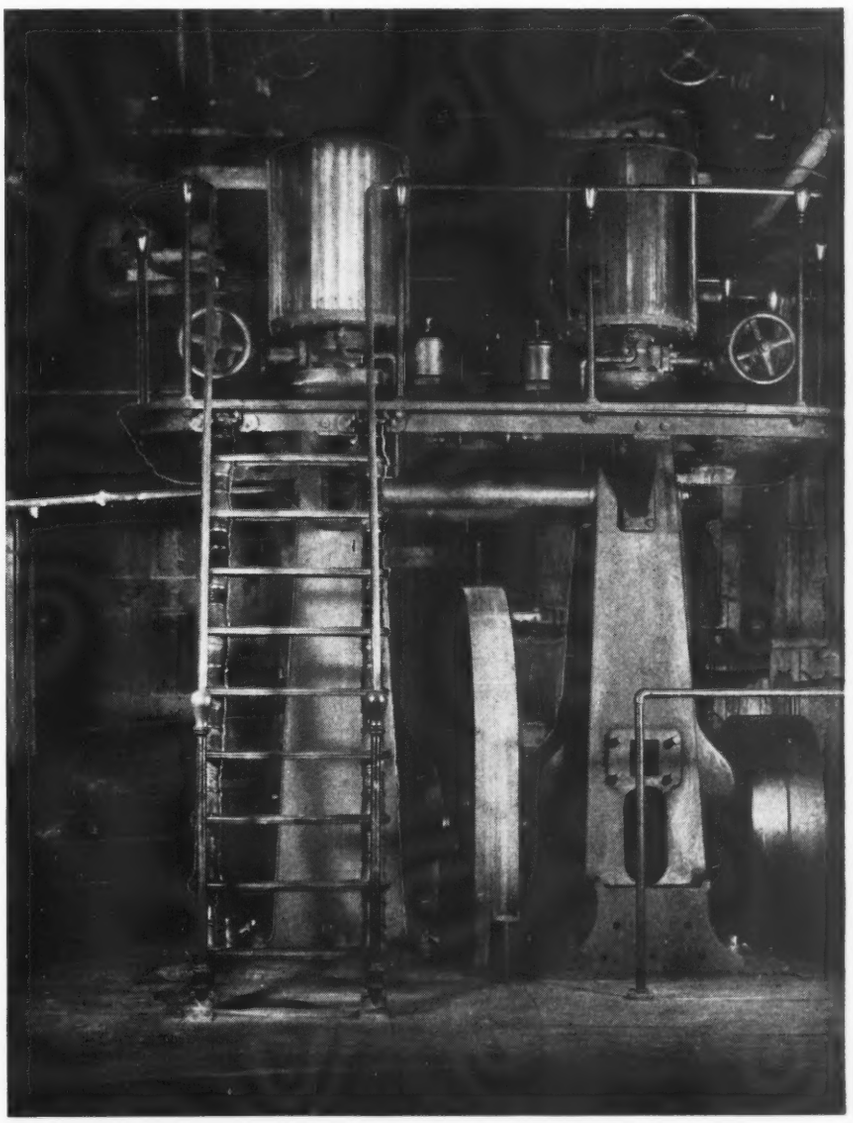
Where there are several compressors, start them one at a time, to cut peak demand. Most of us think of using a booster compressor only if there is work to be done at low pressure—say 20 F below the main load, or colder. It is just as important to use a booster if head pressure is extraordinarily high, because of warm condensing water, lack of sufficient condenser surface, or other reasons. In some cases, booster machines, when properly combined with precoolers and intercoolers, save as much as a third of the power. In modern practice, the liquid ammonia being fed to the low-temperature coils is precooled in the same bath which removes the last of the superheat from the discharge leaving the booster. This discharge gas is first cooled as much as possible with cold water in the tubes of the intercooler, Fig. 1.

If a booster system must temporarily carry heavier loads, try cooling the heads and cylinders of the booster compressor with a rain or stream of water. The temperature of the discharge gas may be lowered 50-75 F, or more. Some of the newer booster compressors are equipped with direct-expansion ammonia jackets for this purpose. Avoid wet compression with booster machines; their low compression ratio wastes horsepower unless the suction is dry.

In an air-conditioning system, considerable power can be saved if the amount of fresh air handled can be reduced safely. Raising the humidity from 50 to say 55% means a further saving. Water can be sprayed on building roofs to cut sun load; a practical help in many cases.

When grinding-in poppet valves, be satisfied when you have obtained a thin seat all around. Scale tends to stick on wide seats. Do not waste time grinding-in ring-plate valves; they will soon "forge" themselves to a seat.

Hard-to-locate troubles may often be found with the aid of the trouble-shooting charts published by the American Society of Refrigerating Engineers, in *Application Data* No. 8. There are 7 pages of these charts, which are part of a 12-page bulletin costing $.30.



In many plants, veterans like this 7½x10x14-in. ammonia compressor, built in 1890, still operate. Modernization offers a means of improving performance

Practical Ways to Meet Wartime Fuel Problems

Stoker maintenance, adapting furnaces and firing equipment to wartime fuel conditions, firing fuels in combination, colloidal-fuel possibilities and coal selection hold the limelight at Sixth Annual Fuels Conference

▶ PRESENTING TIMELY INFORMATION on stoker maintenance, methods of adapting furnaces and firing equipment to wartime fuel conditions, firing fuels in combination, colloidal-fuel possibilities and coal selection, engineers at the Sixth Annual Fuels Conference buckled down to the job of licking today's pressing fuel problems. Held at St. Louis, Sept 30-Oct 1, the conference was sponsored jointly by the Fuels Division, ASME, and the Coal Division, AIMME.

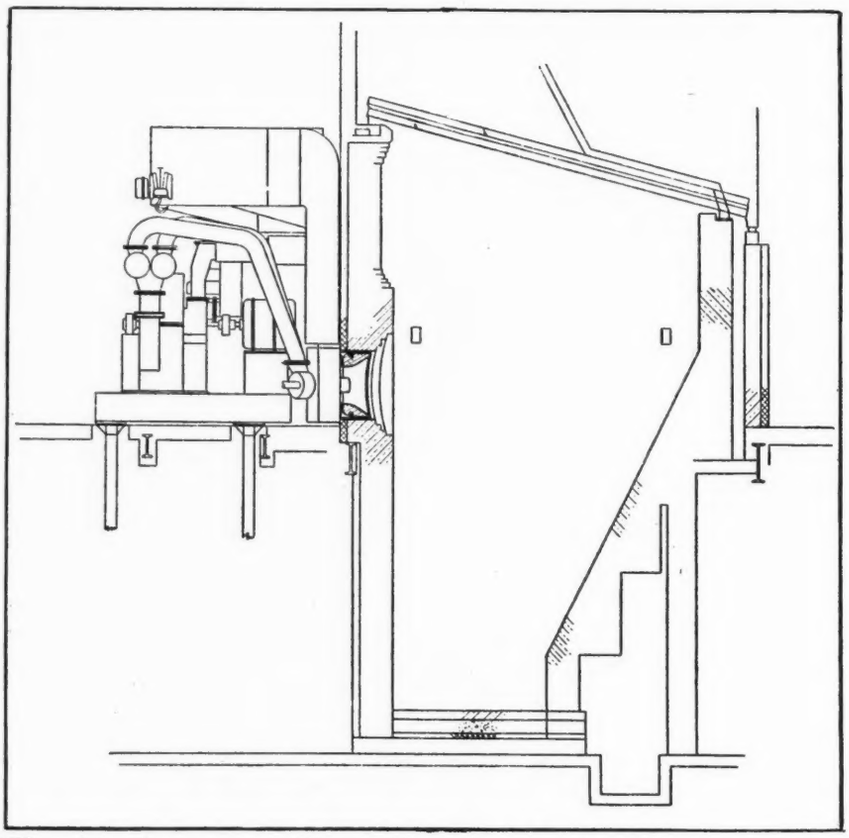
Simple causes lie at the root of almost all cases of excessive stoker maintenance, according to A R Mumford, Combustion Engineering Co, who discussed ways to avoid high stoker maintenance and retain good combustion. Replacing burnt stoker metal represents the biggest part of the cost; stoker metal burns because it gets hot and for no more complicated reason. Keeping stoker parts cool depends on maintaining an adequate flow of air through the grate and a porous insulating layer of ash or coal on the fire side.

For low-maintenance operation of chain-grate stokers select coal with free-burning characteristics and with enough ash to protect the grate at the rear. On natural-draft units, avoid extremely fine sizes which may increase fuel-bed resistance beyond draft capacity. Segregation, resulting from use of fixed chutes and spouts, causes uneven conditions across the fuel bed, some parts receiving more air than others. If swinging spouts can't be installed, or other changes made in the coal-handling system, it is sometimes possible to alter the stoker gate to feed a deeper layer in the region where the coarse coal accumulated, causing the fuel bed to burn off to a more even length over the full width of the fire.

Some actual cases of metal burning have been caused by shutting off the air supply and stopping the stoker when steam demand decreased. This stops the air cooling and permits overheating and burning. When the need for some air flow is kept in mind minimum rates of combustion can be set at about 15 lb per sq ft per hr, below which the stoker should be stopped and burned down.

Most of the causes of high maintenance on chain-grate stokers apply equally to traveling-grate units. Investigations demonstrate that maximum capacity, and to some extent efficiency, decrease almost in proportion to the undersize content of the fuel. This should be borne in mind if conditions force a shift to finer coal. Operators of traveling grates should keep siftings from accumulating; they may ignite and burn in the air chambers. In some cases, such burning generated enough heat to distort the windboxes.

Operators of multiple-retort stokers must usually depend on control of fuel-



When this unit was converted from oil to pulverized coal, the furnace bottom was dropped to basement level to give needed volume and to facilitate ash removal

Percy Nicholls Award to E G Bailey

At the Sixth Annual Fuels Conference, E G Bailey, president, Bailey Meter Co and vice-president, Babcock & Wilcox Co, received the newly created Percy Nicholls Award, for notable scientific or industrial achievement in the field of solid fuel. The citation follows:

"In recognition of the outstanding achievement of Ervin George Bailey in the field of solid fuel, the Fuels Division of the American Society of Mechanical Engineers and the Coal Division of the American Institute of Mining and Metallurgical Engineers confer upon him the Percy Nicholls Award for 1942.

His technical contributions to the art of preparing and utilizing the heat in solid fuel for the benefit of mankind are recognized and applied in all parts of the civilized world. His inventive genius has always been tempered with practicality and has resulted in the maximum usefulness of the mechanisms which he has devised. In him we recognize a lifetime of service, four decades of accomplishment, an inspiration for those who follow him."

bed shape to regulate air distribution and prevent overheating. This means that stoker motion must be maintained in proper adjustment, and that operators must know the characteristics of the particular stoker and the coal being burned. Failure to keep the proper fuel-bed contour will almost always result in high stoker-metal replacement. Segregation causes trouble on underfeed stokers as well as on chain grates; eliminate it if possible. Where a crusher is available, reducing the size range of the coal by further crushing may help to achieve an even fuel bed. Mr Mumford cited several actual cases where faulty operation caused excessive stoker maintenance and showed how good practice cured these conditions.

Compared with one unit of a multiple-retort stoker, a single-retort stoker differs in the direction of ash discharge and the importance of proper motion of parts to provide correct air distribution and progressive feeding and burning. Required motion varies with coal size.

Cases of high maintenance reported included failure to remove siftings from the windbox, neglecting to raise the dump plates after ash had been discharged, use of coal too low in ash, and too-high furnace pressure which caused matting and burning of metal.

With spreader stokers, high maintenance has been caused by raising the firing rate above the capacity of the utilizing equipment to remove the products of combustion. When this is done furnace pressure becomes positive and hot gas will escape from the furnace through the opening in which the spreader mechanism operates. Hot gases burn the spreader-mechanism metal or warp it badly. Excessive firing can be avoided by installing automatic control of fuel, air and furnace draft.

Coal size plays an important part in spreader-stoker operation. Sizes above about ¾-in. nut and slack may force the mechanism to act as a crusher, breaking shear keys or overloading the drive mechanism and accelerating wear. The longer trajectory of the larger lumps causes piling up at the sides and back of the grate, which encourages clinker formation and possible grate burning. Ultra-fine coal usually means increased cinder loss.

Adapting Plants to War

"There are few plants in this country that will not encounter some form of fuel problem because of conditions which arise from the present war," said Ollison Craig, Riley Stoker Corp, in presenting practical suggestions for meeting wartime fuel problems. Because of transportation limitations, it is certain that plants must store more coal than usual and it is possible that coal may be allocated, which would mean lower grades for many plants.

After briefly pointing out the precautions to be taken in storing coal, Mr Craig outlined methods that might be followed to adapt stoker-fired units to fuel changes. Burning lower grade fuels may require more stoker area to maintain capacity; on chain grates area can often be increased by lengthening the stoker, on multiple-retort underfeeds, retorts can be added to increase width or additional underfeed or overfeed sections can be added. Replacing intermittent dump arrangements to permit continuous ash discharge gives the effect of increasing length. Increasing length of side grates yields some extra capacity on single-retort units.

Furnace temperature and clinkering conditions may limit capacity with poorer coal; the remedy lies in providing means whereby the fuel bed can see more cooling surface in the furnace. Typical changes in this direction, include changing baffles, adding water-cooled surface, or changing bridgewall design. However, with certain coals the reverse condition may be true, and exposed surface must be cut off with refractory to raise furnace temperature.

Other furnace changes that may step up performance on low-grade coal include use of high-pressure overfire air and changes in arch design to provide adequate ignition and promote turbulence. Draft limitations can be removed by speeding up fans, installing new runners, or, in many cases, by improving duct and breeching constructions.

On pulverized-coal units, addition of water cooling in the furnace offers many possibilities for boosting capacity as does increasing furnace volume. Pulverizers must be adapted or grinding capacity increased if coals of lower grindability must be used or if wet coal must be ground. If water-cooled surface can't be increased to prevent slagging with low-fusion-ash coals, operation with higher excess air may help solve the problem. Slagging on the furnace bottom in shallow furnaces may be avoided by lowering the floor to increase distance between flame and floor.

Discussing conversion from oil to coal, Mr Craig pointed out that major furnace changes will be required in many cases and discussed the relative problems involved in converting to stoker and pulverized-coal firing. As an example of the compromises in furnace design that must often be made to fit local construction conditions, Mr

(*Continued on page* 144)

Streamlined Signals Supervise Large Air-Conditioning System

228-relay signal and alarm system, installed in central office, oversees and reports on equipment performance at 220 locations throughout the air-conditioning plant in the Metropolitan Life Insurance Co's new home office building

▶ THE NEW HOME office building of the Metropolitan Insurance Co, in New York is completely air conditioned. This building contains 26,000,000 cu ft of space in which about 15,000 employees work. To air condition the building requires about 3200 tons of refrigerating equipment. In the selection of the air-conditioning equipment, the designers kept three objectives in mind. They were (1) the system must give maximum all-year comfort to building occupants, protect their health and increase their efficiency; (2) the system must be able to be operated to attain the first objective; and (3) the system must be efficient and easy to operate and maintain.

To insure that the air-conditioning system will give maximum comfort to the building occupants, operation of all important equipment is supervised from a room in the fourth basement. On a panelboard, Fig. 1, in this room meters show the steam pressure and vacuum in the heating systems; gages show control-air pressure on the various parts of the direct-heating system; switches below them change from day to night or weekend operation and gages indicate air-receiver, street-steam and water pressures.

Control-Signal Units

Below the gages 228 signal units connect to an equal number of strategic points in the air-conditioning system to indicate operating conditions at these points. Each pump- and fan-motor starting contactor connects to a signal unit to show if the motor is running or shut down and sounds a bell to signal the supervisor of a change in operation, such as when a motor is taken out or put in service. A motor cannot stop accidentally without the supervisor's attention being called to it immediately. Faulty operation is therefore detected when it occurs and can be corrected before building occupants suffer discomfort.

On the other hand, if a motor is left running when it should be shut down its signal will call this to the attention of the supervisor, who investigates and orders the motor stopped. This prevents operation of motors with unnecessary use of power when they are not needed over weekends or after business hours on week days.

The low-pressure side of each reducing valve between the high-pressure-steam and the heating mains is equipped with a high- and low-pressure contact. These contacts are tied together and connect to a telltale relay on the supervisor's panel. If the pressure in the heating main goes too high or too low the telltale sounds a gong and an indicating light shows which valve is causing the trouble. This signal system also connects to the cooling

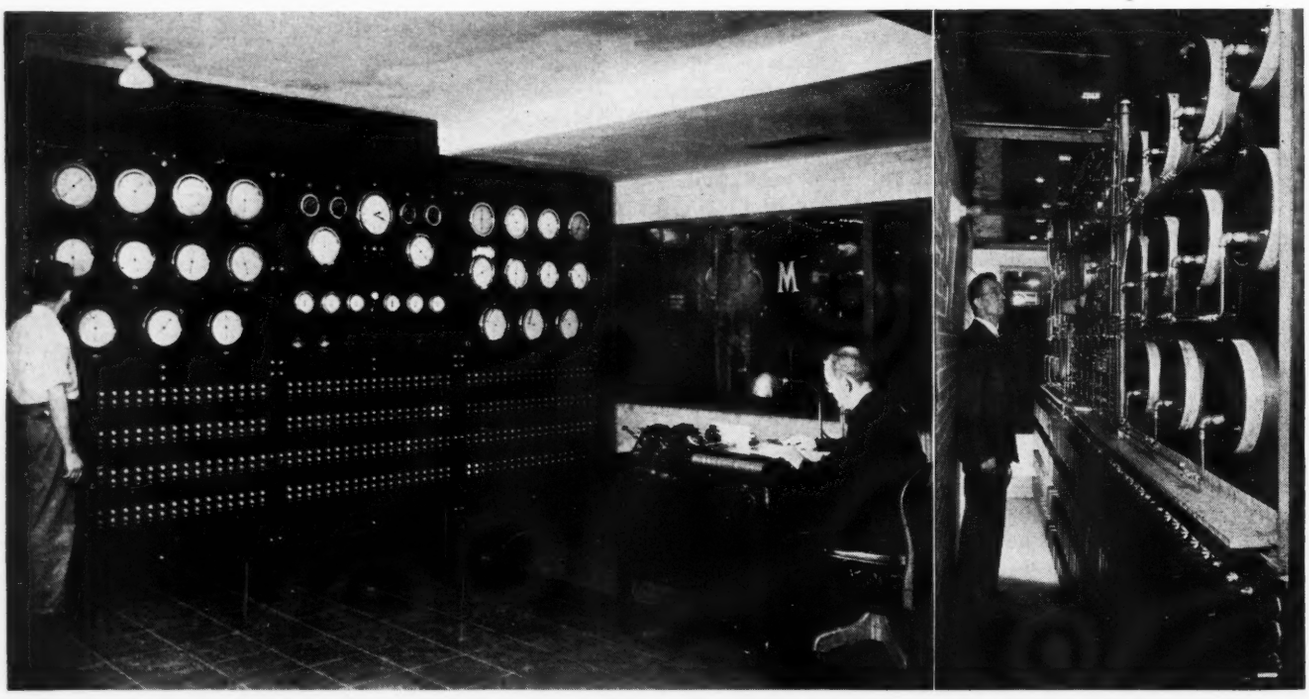


Fig. 1 (left)—On this panelboard are concentrated the metering equipment and 228 relay signal units for supervision of the air-conditioning system from a central office. Fig. 2 (right)—Any one of the 228 relay signal units mounted on the back of this panelboard may be readily removed for testing and adjustment and, if necessary, taken to the shop for repair

towers, the high- and low-water alarms on the surge tanks, and the starters on the motors for the chilled-water and dehumidifier pumps on the air-conditioning system.

Each signal unit consists of two 120-volt relays, a red and a green signal lamp, each with a bull's-eye lens, assembled as a unit, Fig. 5. In addition there are two signal bells for all fan- and pump-signal units and switches in each unit for silencing these bells after they have called attention to an operating change. Separate gongs of a different tone sound the reducing-valve signals. Both signal lights are dark when the equipment to which they connect is running.

Fig. 3 shows the connections for a telltale signal unit when connected to a fan or a pump motor. Auxiliary contact C_a, on the main contactor of the motor starter, opens when the contactor is closed to start the motor. When the contactor opens to shut down the motor it closes auxiliary contact C_a. This contact completes a circuit through the coil of relay *A* and another through the red lamp. Energizing relay coil *A* causes it to close its top contact and open the bottom one to make a circuit for the out-of-service bell through the bottom contact of the relay *B*, and top contact of relay *A* to the minus side of the line.

This bell notifies the supervisor that something has happened on the system and the red light shows him where. In this case, assume that a fan motor has stopped. The supervisor closes the switch on the signal unit, which completes a circuit for the coil of relay *B* to the minus side of the line. Energizing the coil of this relay opens its bottom contact and closes its two top contacts, 1 and 2. Opening the bottom contact breaks the out-of-service bell circuit and it stops ringing. Closing contact 1 completes a circuit for the green signal light. Now the red and the green lights are lit, showing that the unit is off the line.

When A Motor Starts

If the motor stops when it should not, the supervisor notifies the engineer responsible for that section of the building and calls his attention to the fault. When the motor is again started, auxiliary switch C_a opens the circuits through the red light and the coil of relay *A*. This relay then opens its top contact and closes its bottom one. The red light goes out and the in-service gong sounds, a circuit having been completed for it through contact 2 on relay *B* and the bottom contact on relay *A*.

The gong tells the supervisor that a motor has started and the red light going dark leaving the green lit indicates which unit. He then throws the switch on the signal unit to its opposite position which opens the circuit through the coil of relay *B*. Opening contact 1 of relay *B* silences the gong and opens the circuit through the green light. Both lights are now out, showing that the motor is in service. The signal system is now positioned to report shutting down of the motor.

From the foregoing it is evident that everything that happens on the air-conditioning system that might effect its efficient operation is immediately brought to the attention of the supervisor. Also, the signal system eliminates the human element in the correct performance of its functions. The supervisor cannot accidentally make the signals inoperative. They must always be set to report a change in operating conditions, or the gong will sound.

When the air-conditioning system is started, such as after a normal shutdown, the supervisor throws an in-service master switch that cuts the in-service gong out of circuit. As each unit, fan or pump, starts, the red light on its relay goes out and shows that the unit is in service. As each red light goes out, the supervisor opens its in-service switch which breaks the *B* relay-coil circuit, to extinguish the green light.

When all the motors are in service, as indicated by the green and the red lamps going out, the supervisor throws the master in-service switch to the off position. This master in-service switch permits starting the air-conditioning system without a continuous ringing of the gong. A green light on the in-service master shows if it is closed or open. A similar master switch and red light on the out-of-service gong permits shutting down all the fans and pumps at one time without the gong ringing continuously. As each unit is shut down its red lamp lights after which the supervisor closes the out-of-service switch and the green lamp lights.

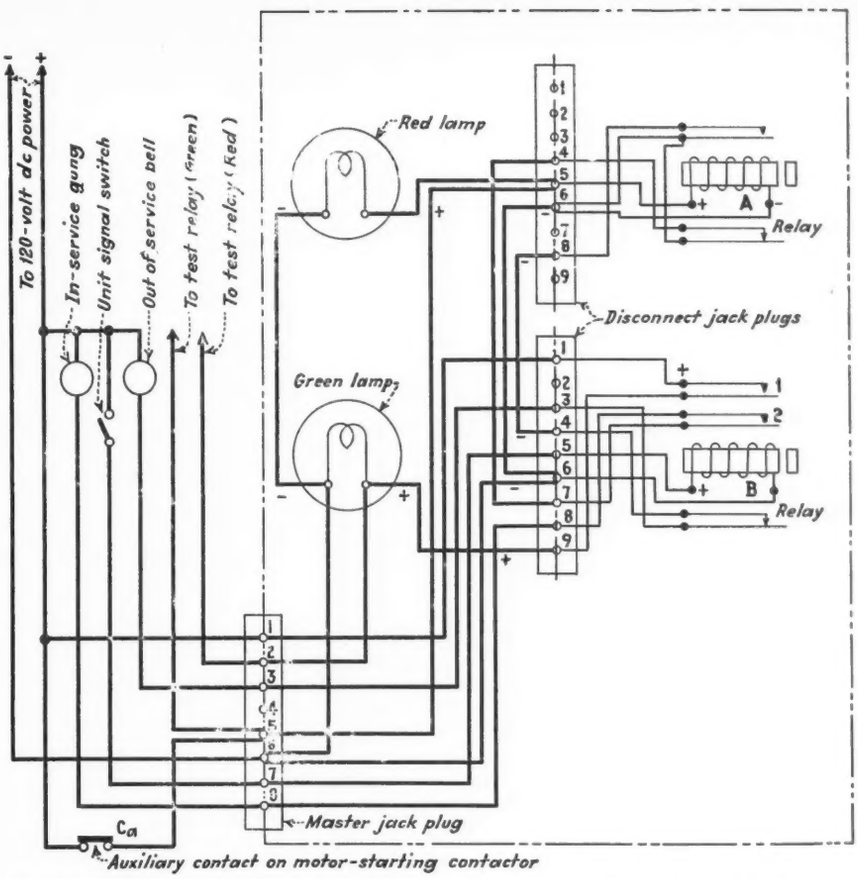


Fig. 3—Wiring diagram of a signal unit that eliminates the human element in the performance of its functions as a telltale of operations on the air-conditioning system

Relay-Test Connections

When all units have been shut down the supervisor opens the out-of-service master switch. Failure of the lamps on any signal relay unit to light shows the supervisor that apparently that fan or pump has not been shut down. He can then call this to the attention of the engineer in that department.

A test connection is provided on each relay for the red and the green lamp. These test connections go to test

relays, with 12 contacts each, to which the green and the red lamp test circuits of six relay signal units connect. Groups of six test relays have their coils connected to 12 contacts on a master relay which can be energized by a pushbutton on the front of the panel above the 36 relays connected to the master. Thus, by pressing a single button the red and the green lights of 36 relays can be tested at any time that the air-conditioning equipment is in service and the signal lamps are dark.

A signal system as large as this one is useless unless it can be easily maintained. When this system was designed, careful attention was given to this feature. All signal circuits coming from the different pieces of air-conditioning equipment connect to terminal blocks located in a pull box with access doors at the top of the panelboard. The base of each relay signal unit mounted on the panels contains the female half of an eight-pronged jack plug. Wiring on the panelboard connects the plugs to the terminal blocks at the top of the board. In case of trouble in the wiring the faulty circuit can be easily opened at its terminal block and the two sections of wire tested separately.

Relays Easily Removed

In the assembly of each relay signal unit, each relay is wired to the male half of a detachment plug, so that it may be readily removed. The female halves of the relay plugs, the signal lamps and the male half of the plug in the signal-unit base are mounted in a frame and connected. The assembled signal unit then plugs into its base and is held in place on two bolts with wing nuts.

In case of trouble on a signal unit either relay may be readily replaced by pulling the faulty one out of its socket and plugging in a new one, Fig. 4. Or, the whole relay signal unit may be removed by taking off two wing nuts, pulling it out and pushing a new one into place, Fig. 5. The faulty relay may then be taken to the shop for testing and repairing. Thus, when a fault occurs on a signal unit, the unit and wiring can be readily broken into parts to isolate the fault. To expedite this work all wires coming to the terminal blocks at the top of the board are identified as to the relay signal units and the equipment to which they connect. This makes it possible to locate any wire in the system immediately for testing or other purposes.

The system operates on 120-volt direct current, which eliminates the capacitance effects of alternating-current operation that may cause faulty performance and other objectionable effects.

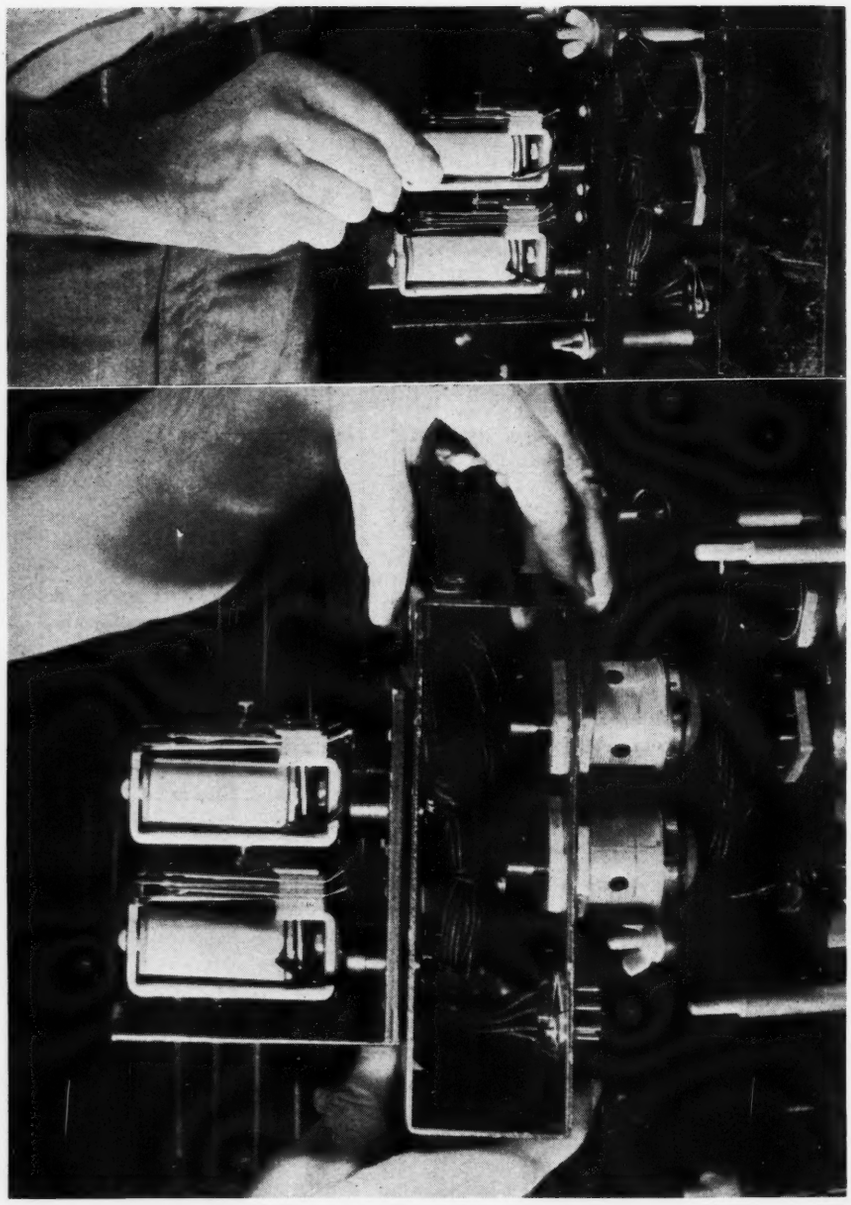


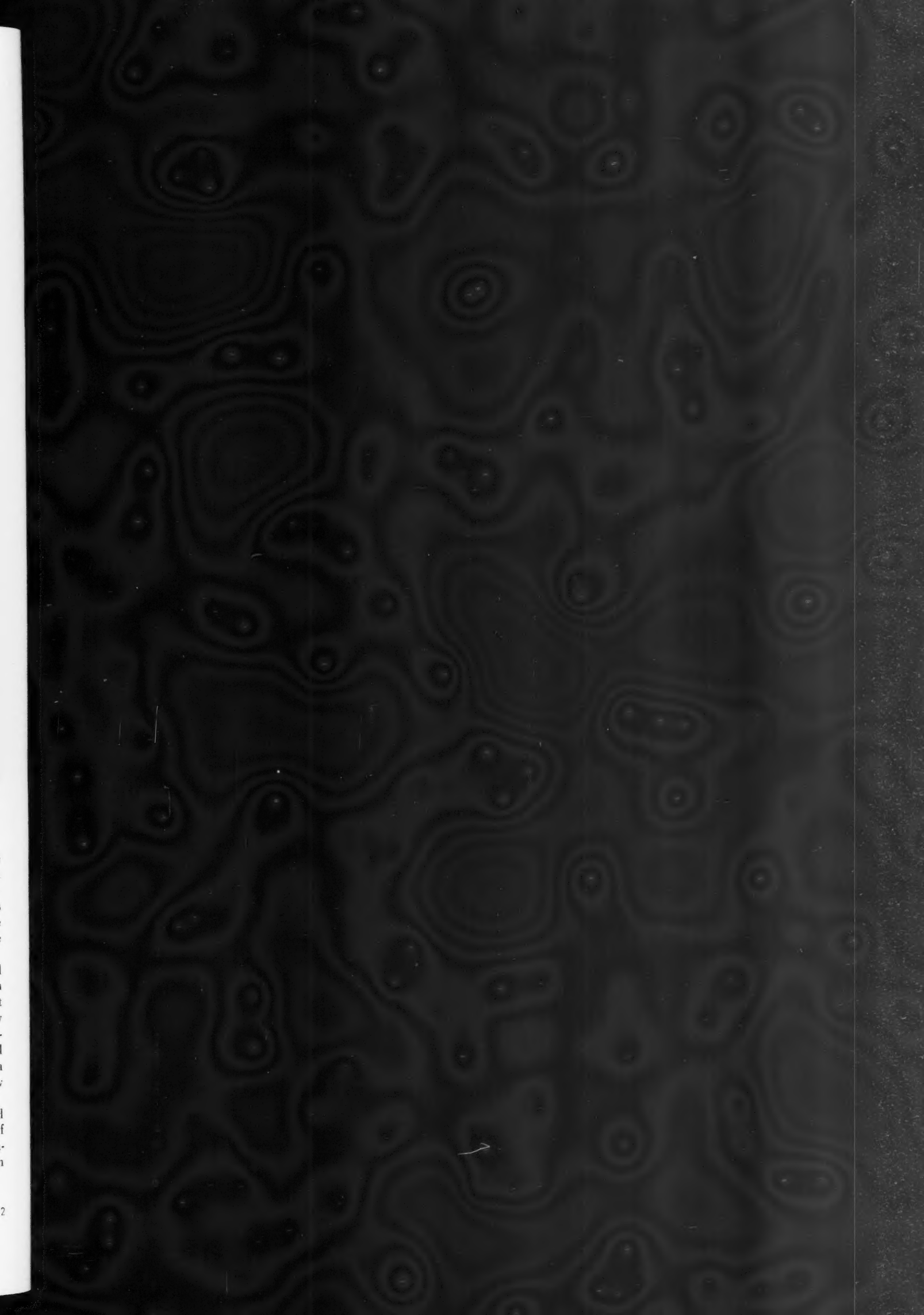
Fig. 4 (top)—Each relay connects to its base by an attachment plug and can be easily replaced. Fig. 5 (bottom)—Each signal unit, relays, green and red lights and signal switch are wired as a unit to plug into its supporting base on the panel

All other alarm systems for the building, such as for fire and low or high service water, are in the same room with the air-conditioning signals. This centers all alarms in the building under the supervision of one attendant; consequently an alarm or signal gets immediate attention. Doing this has proved highly satisfactory, because responsibility is centered in one man and no time is lost in taking the necessary action when an alarm sounds.

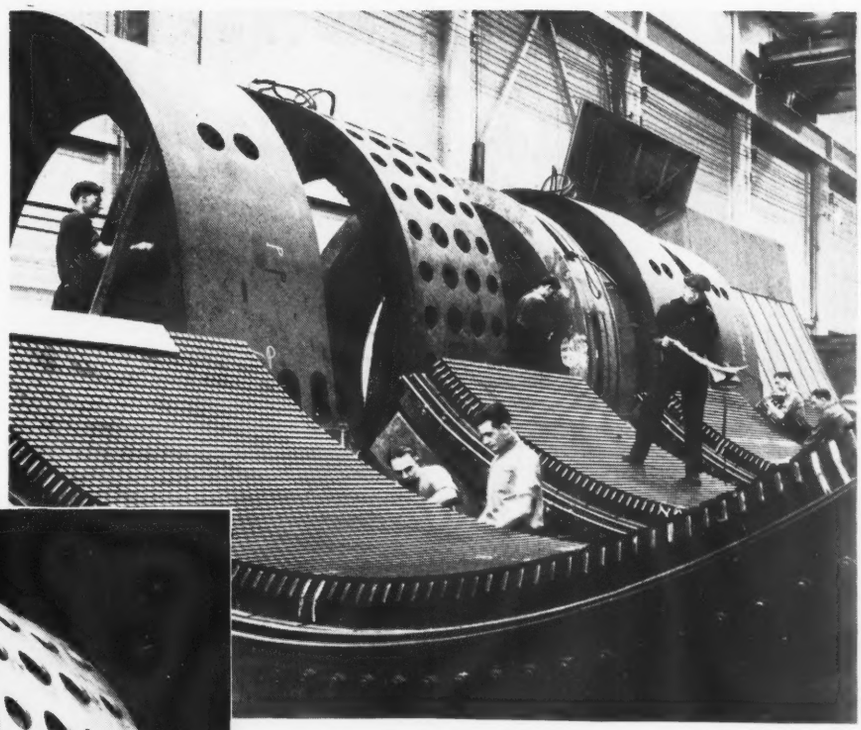
The air-conditioning signal system operates with a high degree of reliability even though it is the first of its kind installed, which speaks highly of the care taken in its design and installation. The only trouble of any account was caused by high temperature inside the lamp cases, resulting in short lamp life. This has been corrected by replacing the 120-volt lamps with 240-volt ones. These lamps give ample illumination of the red and the green lenses and have a long life.

The signal relays, lights, gongs and their wiring form the nervous system of the air-conditioning equipment, that ties its operation to one supervisory brain. It has made it possible to operate this equipment, installed on all floors of the building, so as to do a 100% job at high efficiency and low operating cost.

The signal system was designed and installed by the electrical engineers of the building, to whom POWER is indebted for assistance in the preparation of this article.



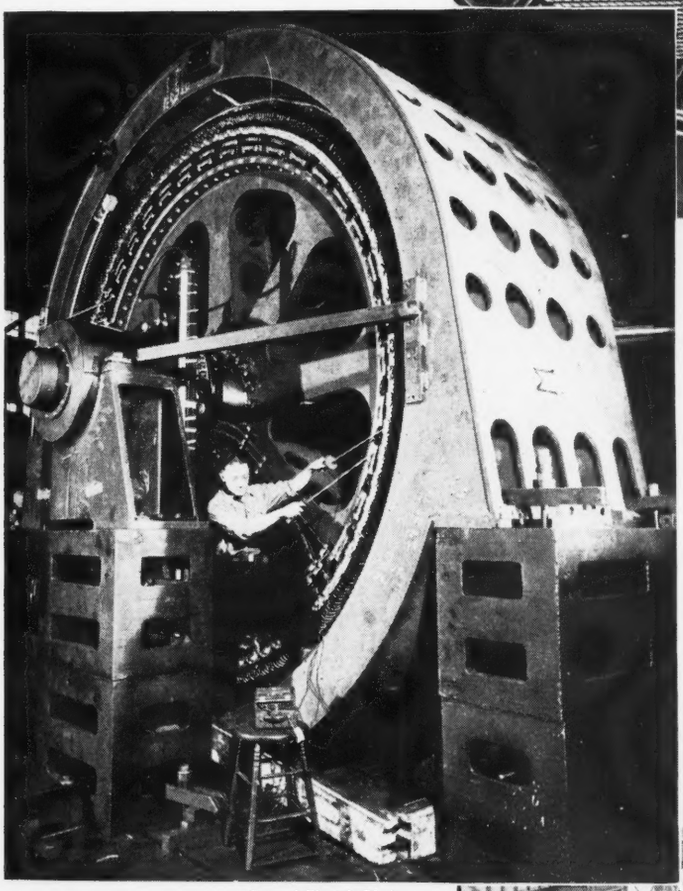
Ship motors stem from the same production line as generators for an important hydroelectric project. In the background are four large ship-propulsion motors for turbine-electric tankers. Turbine-electric drive for these ships produces high-speed maneuverable carriers without taxing marine-gear-making capacity. Wanted—men with marine engineer's licenses to take dangerous assignments carrying gasoline, diesel and fuel oils to the far corners of the earth



General Electric Photo

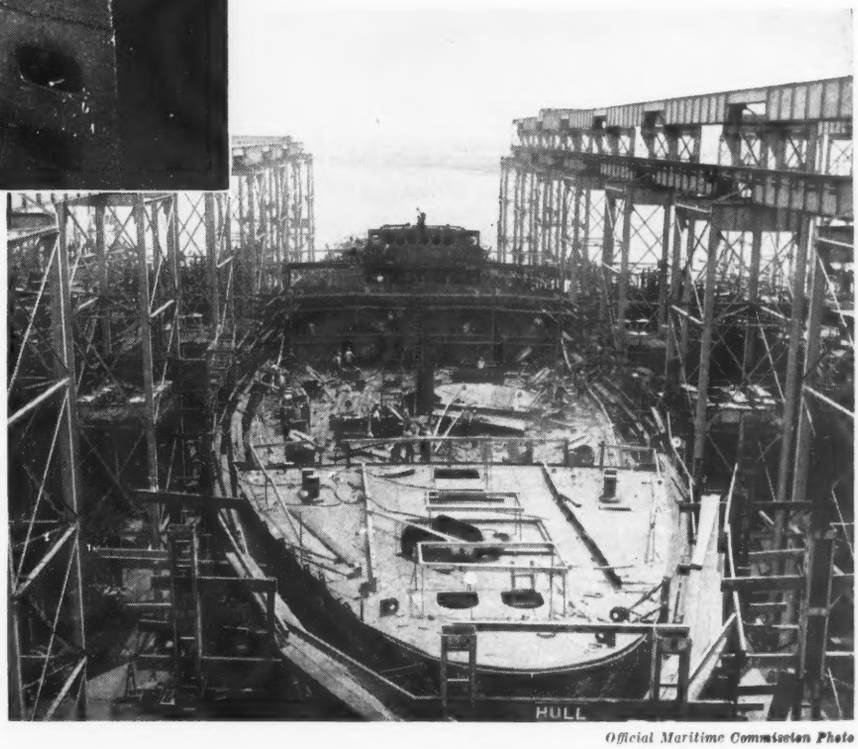
ELECTRIC SHIPS— Oil-Shortage Antidote

Giant motors drive the 5,000,000 + gal tankers that supply fighting United Nations mechanized field armies



General Electric Photo

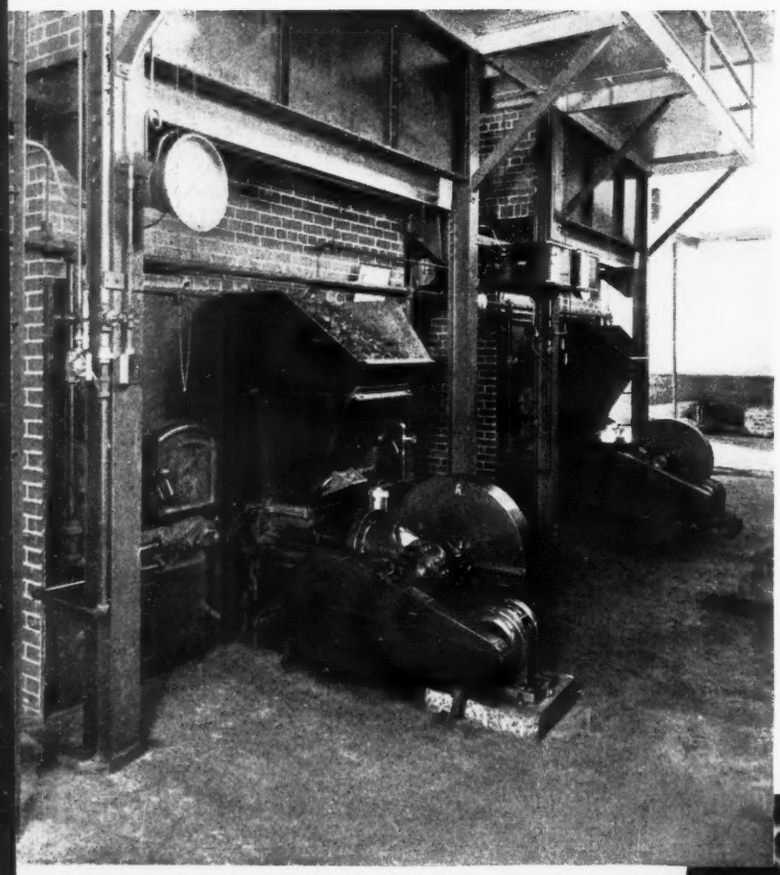
Completed and ready for installation in an electric-drive ship is this propulsion motor being tested for voltage drop across each pole by 23-year old Francis Li, born in Hong Kong, and Manhattan College engineer of 1941



Official Maritime Commission Photo

Shipyard view of tanker construction. These 500-ft ships, armed against submarine and air attack, will play an important part in supplying fuel to fighting planes, tanks and warships as well as in later peacetime industry

Riley Coal Burning Equipment

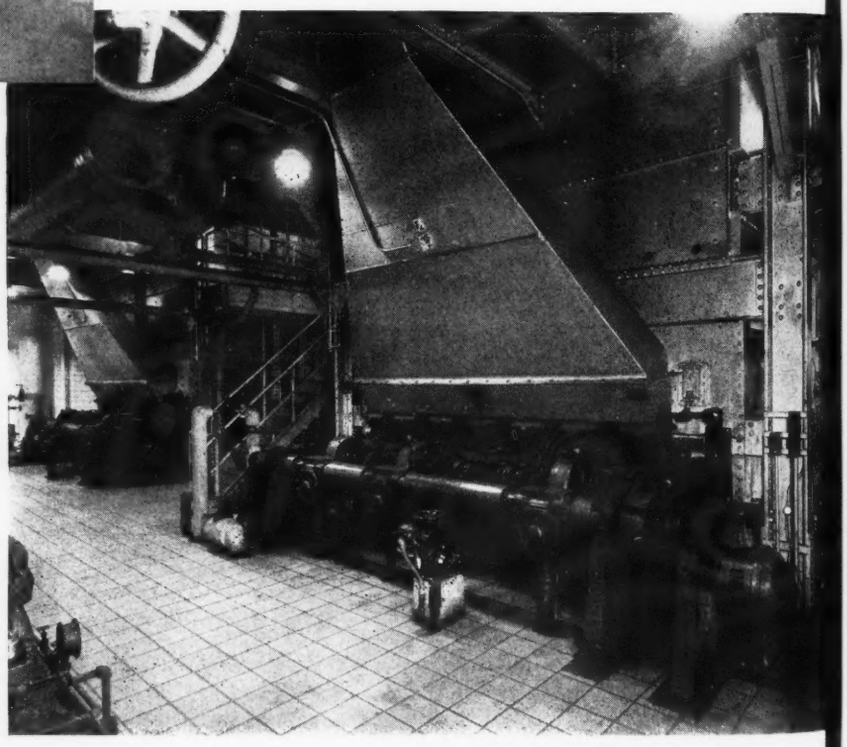


As manufacturers of practically all types of coal burning equipment, the Riley Stoker Corporation is in a position to be of service to you if you find it desirable or necessary to change from oil to coal firing.

Riley-Jones Side-Dump Stokers for boilers from 40 H. P. to 600 H. P.

Because Riley-Jones Side-Dump Stokers are adaptable to practically any boiler setting with but minor changes and because no basement is required for their installation, Riley-Jones Side-Dump Stokers have been selected by many plants when changing from oil to coal.

Riley-Jones Side-Dump Stokers are manufactured with either stationary or moving grates and with mechanically, hydraulically or steam driven coal feeding rams. The Riley-Jones is the original underfeed stoker—the daddy of them all. Constant improvement has kept it at the head of the list. Thousands of the country's leading companies use them.



Riley Multiple-Retort Underfeed Stokers for boilers from 250 H. P. up

For larger boilers, where basements or other means are available for ash disposal, Riley Multiple Retort Underfeed Stokers can be installed. Riley Stokers can be furnished either with continuous rocker dump or with single or double roll clinker grinder. You will find Riley Stokers installed in many of the leading central station and industrial plants.

RILEY

STOKER CORPORATION, WORCESTER, MASS.

Boston New York Philadelphia Pittsburgh Baltimore Buffalo Cleveland Detroit Chicago St. Louis Cincinnati St. Paul Kansas City Denver Seattle Portland Los Angeles Houston New Orleans Atlanta Memphis Richmond

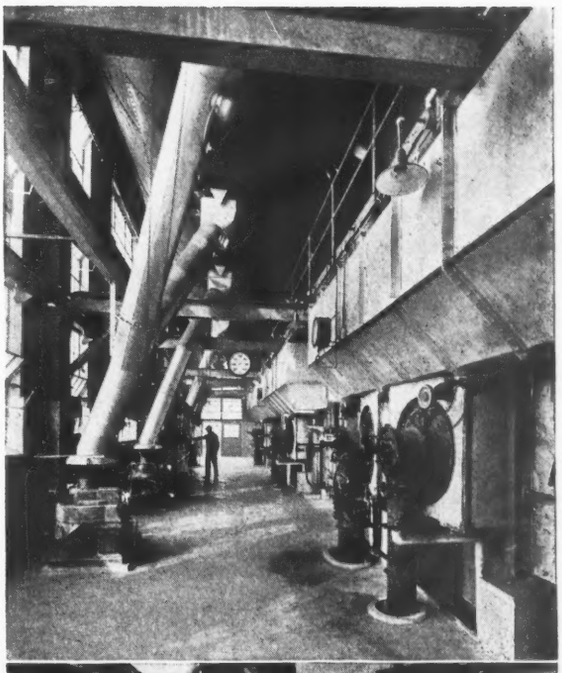
It will pay you to visit modern Riley Installations

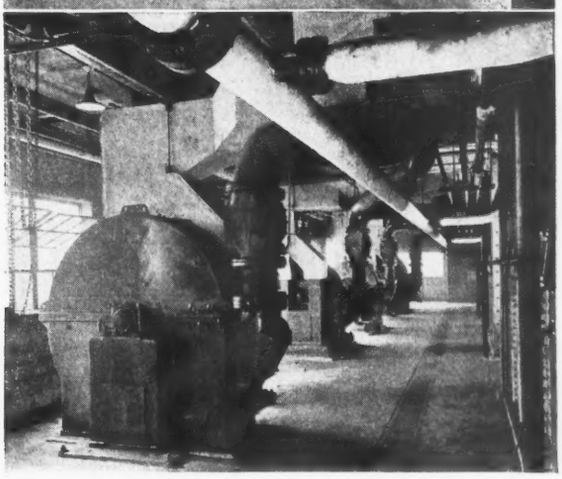
for your shift from oil to coal

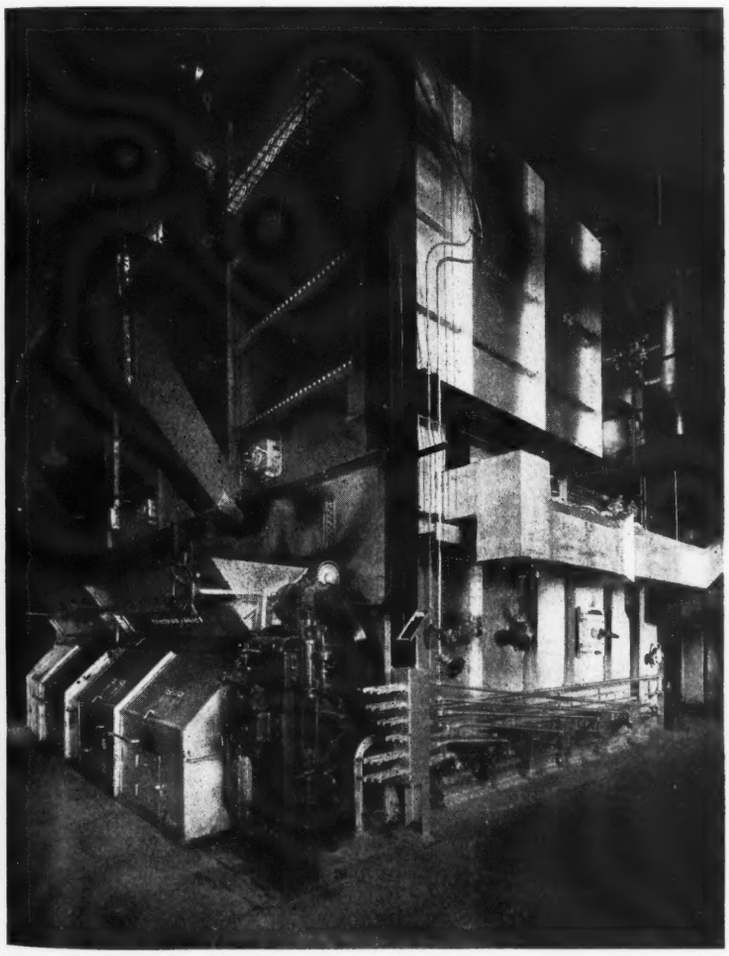
Riley Pulverized Fuel Equipment for boilers from 100 H. P. to the largest

When conditions make it desirable to use pulverized coal, Riley Pulverizers, because of their compact size and quiet vibrationless operation, can be installed with a minimum of difficulty. Oil fired units ordinarily operate at higher heat releases so that in some cases, when changing to pulverized coal, the furnace volume must be increased or the unit operated at lower rates.

If pulverized coal equipment is installed, the unit in the future will be capable of burning either oil or coal, depending upon the relative prices of the fuels. Riley Pulverizers are made in capacities from 1,000 to 35,000 pounds of coal per hour.







Riley Harrington Traveling Grate Stokers for boilers from 150 H. P. up

When anthracite can be burned instead of oil, then the Riley-Harrington Traveling Grate Stoker can be installed. Due to the fact that arches are required for proper combustion of anthracite coal on traveling grate stokers, changes in the setting are more extensive than when bituminous coal can be burned. The Riley-Harrington Stoker also efficiently burns coke breeze, lignite and the lower grades of bituminous coals.

A survey of your power plant by a consulting engineer will possibly show ways of making surprisingly large savings in power costs

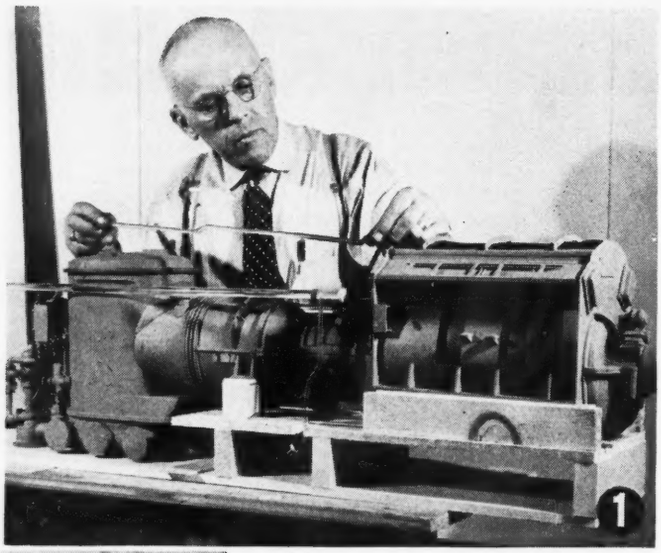
COMPLETE STEAM GENERATING UNITS

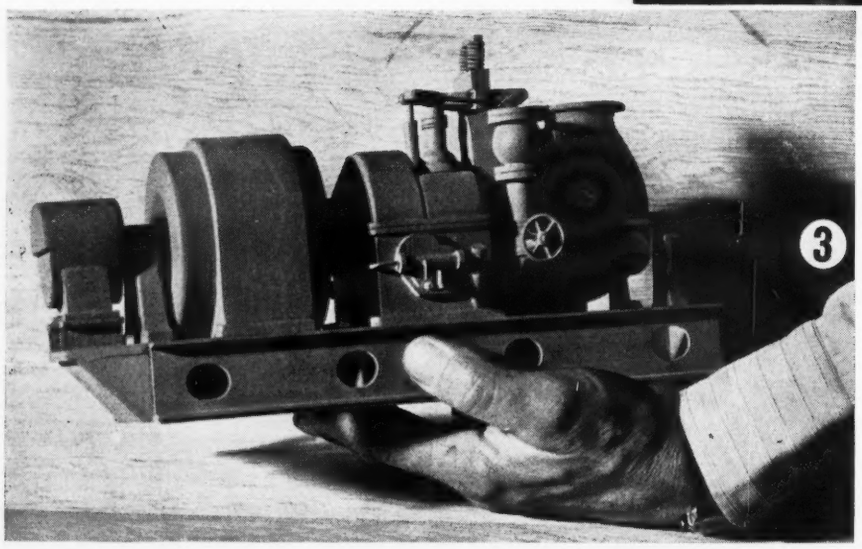
BOILERS • PULVERIZERS • BURNERS • STOKERS • SUPERHEATERS • AIR HEATERS
ECONOMIZERS • WATER-COOLED FURNACES • STEEL-CLAD INSULATED SETTINGS • FLUE GAS SCRUBBERS

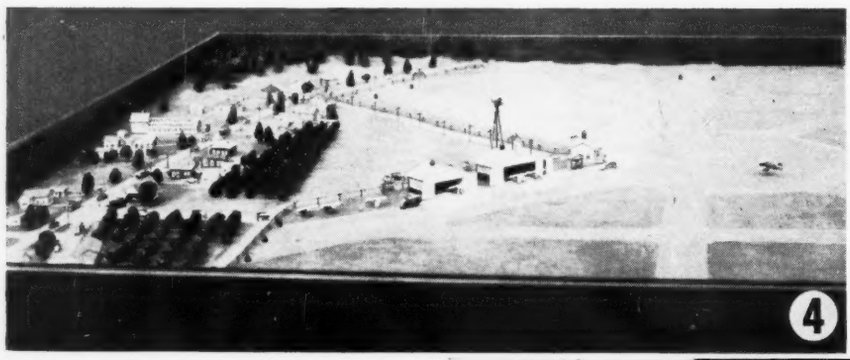
before purchasing Boiler or Fuel Burning Equipment

Preview in Miniature

By H E CHESEBRO
General Electric Co







1 Scale model of a steam turbine generator with the author checking pipe details. An excellent means of verifying engineers' designs of a new power unit

2 Applications of electric power, too, are represented by the modelmaker. This continuous enameling furnace is built to a scale of 1½ inch to the foot

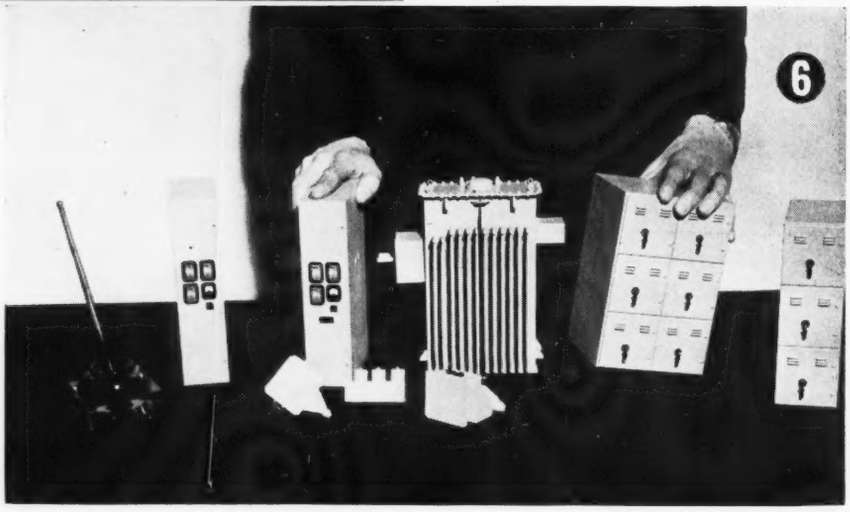
3 An auxiliary set for a power plant in miniature. It is accurate enough to pass for the real thing (without the hand)

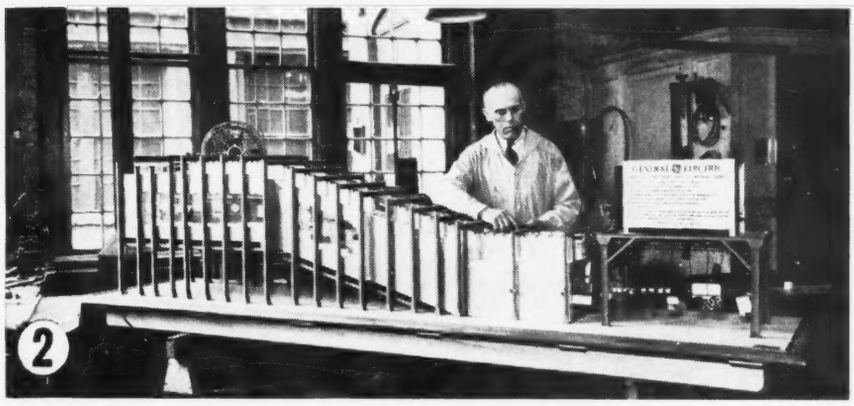
4 Versatile modeler applies his art to many fields beside power equipment. This is a completely lighted airport, with even an automatic revolving beacon.

5 This photo of a model could be readily mistaken for an elevation view of the real thing

6 Unit substation parts can be assembled quickly in a number of combinations to suit individual needs

7 For demonstrating flexibility of standard equipment, these unit substation building blocks illustrate compactness and arrangement





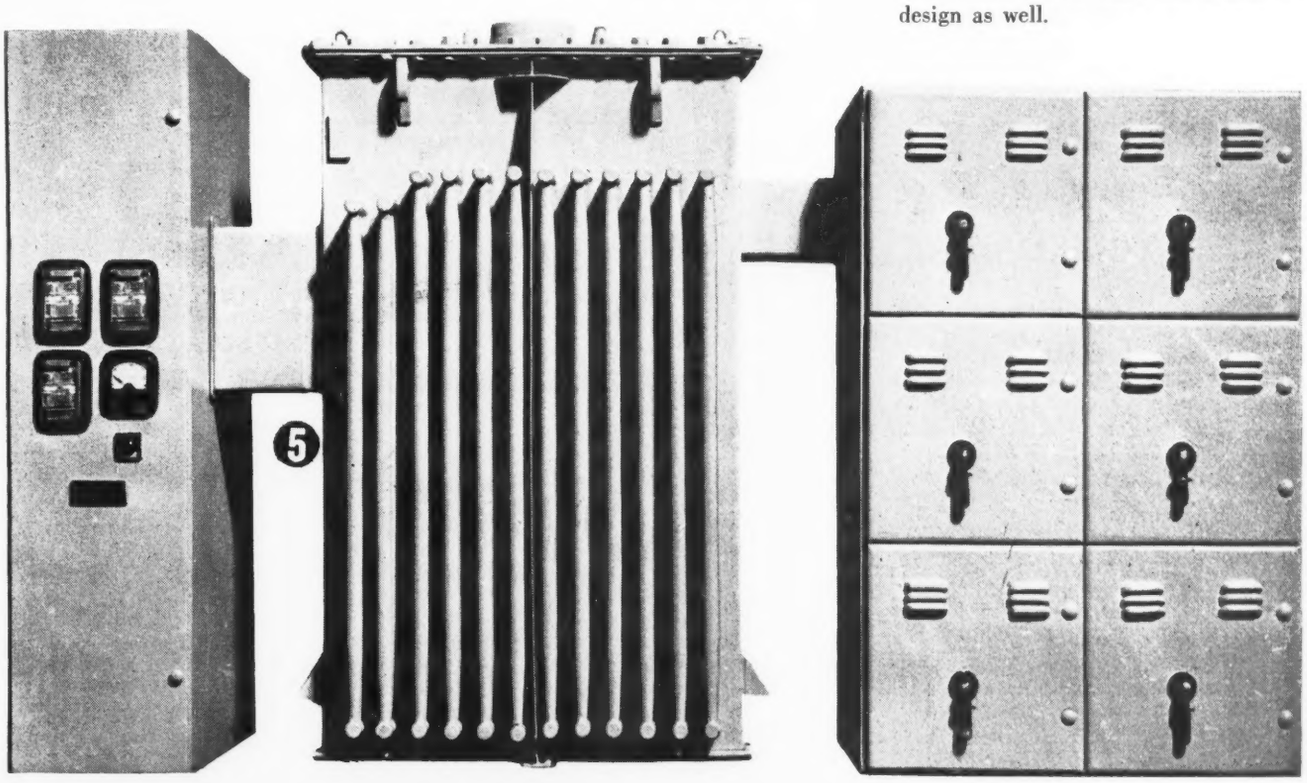
WHAT ALPHABET BLOCKS are to reading and writing, scale models have become to designers of intricate machinery or construction men facing possible "negative clearances." Models prove the practicability of an idea or the correctness of assembly. For example, when a universal base for testing turbines was first proposed, a model demonstrated that it could be adapted to fit various sizes of turbines.

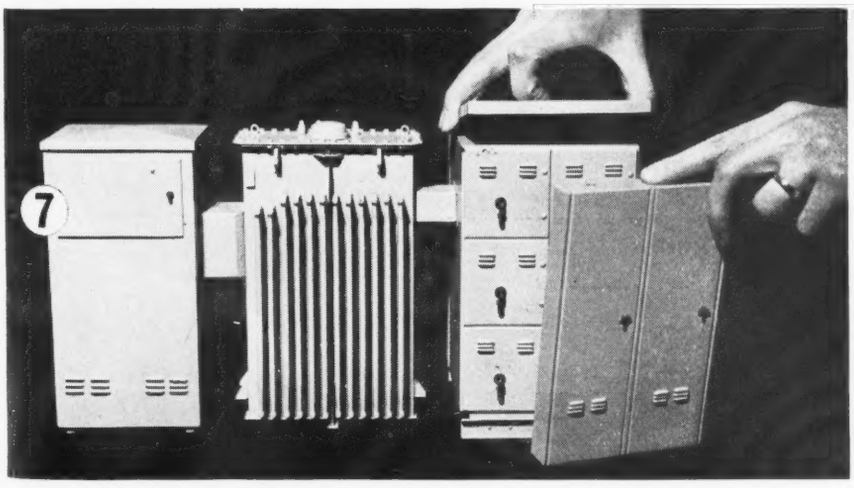
A somewhat similar purpose was served by a model of a steam power plant to work out piping arrangements around the foundation. Cost of the model has been charged off as good insurance against costly mistakes in actual construction.

In some cases it is necessary to make only part of the equipment or apparatus in model form. In others, parts of a model can be removed for study by individuals concerned only with that part.

Patience and imagination characterize the true model maker. He must know both wood and metal working, be able to cast, carve, sand and solder, and, of course, read scaled-down blueprints. Workmanship varies from rough outlines for vizualization and checking clearances to cutaway detailed representation of internal construction.

Models have a 3-dimensional advantage over drawings. They are being used by General Electric not only to facilitate understanding of apparatus to be built but to work out details of design as well.

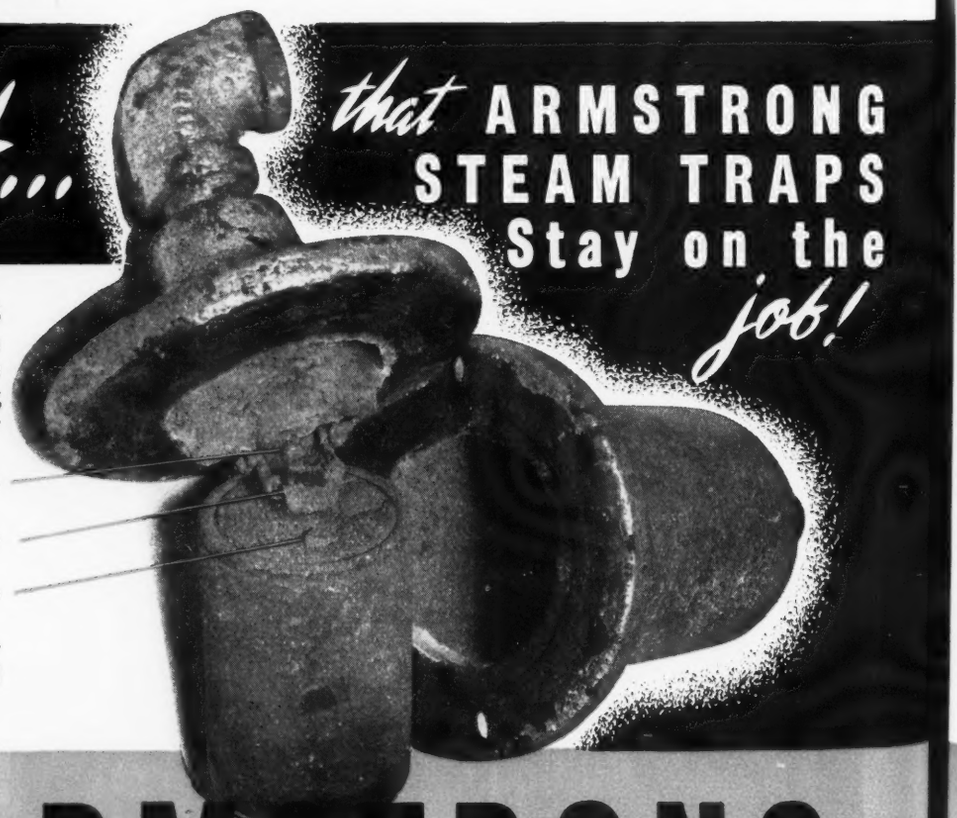




for LESS "PATCHING"

FEATURES Operating Engineers want in Steam Traps:	THE ARMSTRONG STEAM TRAP:
1. Ability to draw off air.	✔YES
2. Ability to handle hot condensate.	✔YES
3. Ability to handle all ordinary sediment and sludge.	✔YES
4. Freedom from wire-drawing in orifice.	✔YES
5. No steam loss for any load condition.	✔YES
6. Ability to hold tight against vacuum.	✔YES
7. Freedom from friction and wear.	✔YES
8. Small size — light weight.	✔YES
9. Simple construction.	✔YES
10. Large capacity.	✔YES

Here's proof... that ARMSTRONG STEAM TRAPS Stay on the job!



THIS picture shows how from 1/16 to 3/16 of an inch of hard scale was deposited on the inside of the body and cap as well as on the working parts of a No. 212 Armstrong Trap before cleaning was necessary. Note particularly the following:

1. Bright line on valve which shows that valve parts were working.
2. Scale broken from bucket hook to indicate thickness of scale.
3. Scale around bucket vent but the vent was still open.

It takes an Armstrong free-floating lever trap to operate for long under such bad water conditions!

Saving Fuel, Metals and Manpower for the Battle of Production

ARMSTRONG

and LESS "PRAYING"

1. Use Armstrong Steam Traps
2. Install Them Properly
3. Inspect Them Regularly

AMERICAN Industry has been exhorted to "patch and pray" to keep war production rolling in face of tremendous obstacles—shortages of equipment, materials and manpower.

Armstrong Steam Traps can help you meet this challenge.

1. USE ARMSTRONG STEAM TRAPS:

To Conserve Fuel — Records show such savings as a ton of coal per day, 12 gallons of fuel oil per hour, $2500 worth of fuel per year.

To Reduce Maintenance — One plant saves 19 days per month of one man's time on trap and piping maintenance since installing Armstrongs; others report trap maintenance reduced as much as 95%.

To Eliminate Need for More Boilers — A considerable number of plants, on the point of ordering new boilers, have found that Armstrong Traps will enable existing boilers to do the work.

To Speed Up Heating — Users' reports show 30% less time to bring jacketed kettles to a boil, 20% more output from equipment with unit trapping and similar production-increasing advantages.

2. INSTALL THEM PROPERLY

— This is essential to the securing of maximum benefits. It's made easy by Armstrong side inlet and bottom inlet styles, by practical condensate drainage data in the Armstrong Steam Trap Book and by full cooperation of Armstrong Representatives.

3. INSPECT THEM REGULARLY

— An easy, quick job. The cap carries the works—just remove it. Repairs are simple and fully explained in Armstrong literature, but seldom required. "10 years service with no repairs," reads one report; 6/100 of a cent per trap per year over a five year period is the maintenance cost in another plant.

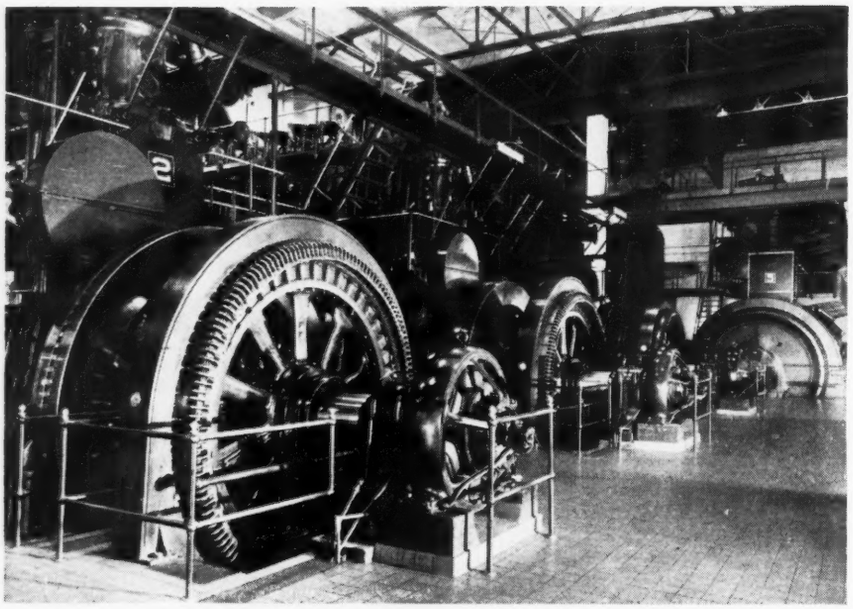
Take advantage of what Armstrong Traps can do to help you win the war. See your local Armstrong Representative, or write.

ARMSTRONG MACHINE WORKS
812 Maple Street, Three Rivers, Michigan

SEE OUR CATALOG IN SWEET'S

this
BULLETIN
is designed to help plant maintenance engineers get maximum life and efficiency from their traps. Write for your copy.
SERVICE GUIDE
and Wartime Conservation Suggestions for
STEAM TRAP USERS
Published by

Tested Capacity **STEAM TRAPS**

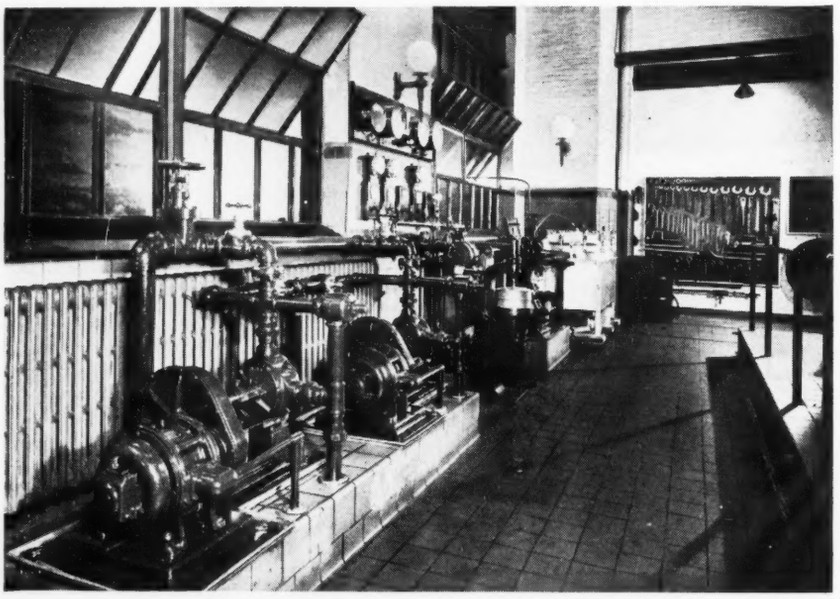


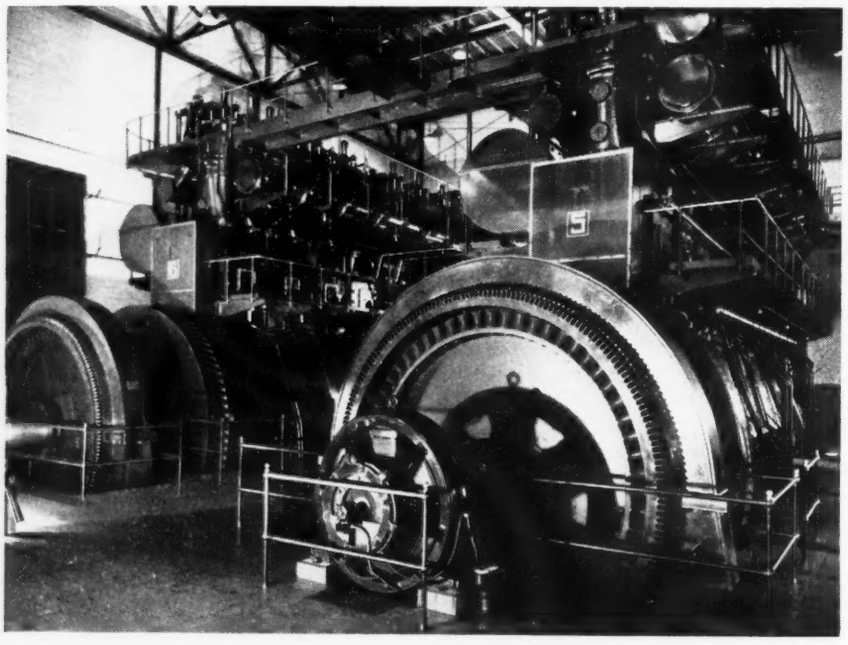
View toward south end of station shows 1250-hp Units 2, 3 and 4, with 2865-hp Unit 5 in the background (See page 64)

Lubricating-oil conditioning plays an important part in plant operation. Here's one of two pumping and centrifuging centers with new reclaimer at rear

Rockville Centre in Pictures

Use of large slow-speed engines of proved reliability and economy characterized plant growth from 3350 hp to the present 12,500





These 2865-hp units are the largest 4-cycle single-acting air-injection engines installed in an American diesel plant. They are of crosshead design, with eight 29x48-in. cylinders, operating at 120 rpm

Construction—Builder of Bases

America's Great Peacetime Industry Goes to War

PUNCHED through 1,600 miles of trackless wilderness and rivaling the Panama Canal in strategic importance, the Alaska Highway will cut days and dangers from present supply routes . . . to Alaska . . . to the Aleutians . . . yes, to Japan itself!

This job, to be finished soon and well ahead of schedule, is but one example in thousands illustrating how construction sets the stage for our war effort . . . and why the construction engineer is vital to victory.

Back of America's busy production lines, expanding shipyards, growing cantonments and far-flung military bases is a series of swiftly executed construction jobs. Important jobs! *For the construction industry is a builder of bases. Bases for production—for training—for defense—and for attack.*

To conceive and to carry through so tremendous a program in a race against time is typically American. It requires enterprise and the sort of versatility that has been acquired by undertaking every kind of job; from a Boulder dam to a drydock, from a Pennsylvania Turnpike to a housing project, from a Radio City to a railroad tunnel . . . and taking it in stride. War's demands in the eyes of America's construction men, are simply more of the same—for a grimmer purpose, and under heavier pressure.

The civil engineers who develop the necessary designs, the contractors who execute them and the manufacturers who provide the equipment and materials, are as much a part of this war as are the men who face the enemy. The results of their labors are recorded in mounting production figures, and will be indelibly written in the military annals of this war. Those 60,000 airplanes, 45,000 tanks and 8,000,000 tons of shipping that the President asked for in 1942 will be supplied because—and only because—the construction industry did a Herculean plant-building job first—and fast.

This is the fifth of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers, and in daily newspapers in New York, Chicago and Washington, D. C. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.

Yes, construction, America's great peacetime industry, has gone all out for war. From a normal 6½ billion dollars in 1938, it got into its war stride last year with a 11½ billion dollar volume. And under the impetus of Pearl Harbor, the 1942 figure now promises to reach the unprecedented total of 15 billion dollars. "If buildings would win the war, Hitler would be licked now", said Lieut. Gen. William S. Knudsen recently. Which emphasizes the further fact that the construction industry was the *first* to go to war.

The technical and managerial talent that is accomplishing this mammoth job has had to find its strength and resources within itself. No possibility of "conversion" here! Only years of varied construction experience enabled it to tackle and to achieve the manifold tasks that building for war demands.

Take that cornfield, for instance, that Henry Ford picked for his record-breaking bomber plant. The spring mud was soft and deep when contractors moved in last year. They were entering a race against an almost impossible time limit. Before they could even begin on the plant itself, they had to build roads, lay a 4-mile water supply line and install a complete sewerage system with its disposal plant. But such varied jobs—each big in its own right—merely were antecedent to running up the framework and enclosure for the 60-acre factory itself. Or to using road-building methods to pave a floor that was the equivalent of 25 miles of 20-foot wide concrete highway.

It was a race against the approaching winter, and to win it they had to push their $1,000,000 worth of construction equipment to the limit—day and night. But win they did! It is accomplishments like these that explain how the nation's aviation factory floor space jumped from 18,000,000 to 60,000,000 square feet in

the past two years . . . why Fortresses and fighter ships are beginning to turn the scales of war in our favor.

"Somewhere in the Southwest" the Army called for a training base. The contractor who answered that call summed up his performance in characteristic fashion: "Beginning without so much as a contour map we had a $10,000,000 project ready for operation within 90 calendar days, and saved 3½ million dollars of the estimated cost".

At another Army camp a contractor assembled a crew of 20,000 men who put together 1,400 buildings in 125 working days, along with a sewer system, a water-supply and a street layout of which many a fair-sized city might be proud. This job swallowed up 2,000 carloads of lumber, and 26,000 kegs of nails. So perfect was the teamwork, from the general manager down through the hundreds of superintendents and foremen to the specialized crews, that as many as seventy buildings were erected in one single day.

But versatility and experience are not the only qualities that the construction engineer has in his tool chest. He has ingenuity, and he needed it when steel, copper, zinc and aluminum had to be used for combat equipment, and were denied him. Great hangars, conventionally of structural steel, were turned out with record-breaking timber arch spans. Reinforced concrete factories were designed to require only 3 lb. of steel bars per square foot instead of the customary 5 lb. Asphalt-impregnated paper was substituted for copper in flashings, cement-asbestos for galvanized steel in duct work. In the face of a materials shortage, he continued to build bases—safely, economically, and on time.

Construction ingenuity, too, is back of the records in Liberty ships, in war housing and a host of other facilities. Indeed, it was the construction industry that stepped forward to assume the bulk of the emergency shipbuilding program, leaving established yards free to handle more specialized Navy work. Naturally, it was easy for civil engineers and contractors to build the shipyards, but building ships was another story. It is a far cry from steel ships to conventional engineering structures, yet, drawing upon their bridge and building experience, the men of construction have turned out ships faster than they were ever built before.

How was this possible? . . . because the construction man sees every job as a new problem, views every precedent as something to be discarded in favor of something better. So instead of assembling the myriad separate pieces of each ship on the ways, he fabricated them into huge built-up sections. These he swung to the ways and welded them into place in a fraction of the time required by old methods.

Again, the demands for wartime housing for workers in industrial areas, at Navy bases, and near Army concentrations, have altered the meaning of "residential construction". The building of individual houses has given way to a form of multiple-unit project that calls for the skilled services of the architect, the civil engineer and the large contracting organization. On one such project, for example, a contractor experienced in large building and bridge construction employed an extensive system of prefabrication and site assembly that made possible the completion of 5,000 houses for war workers within five months.

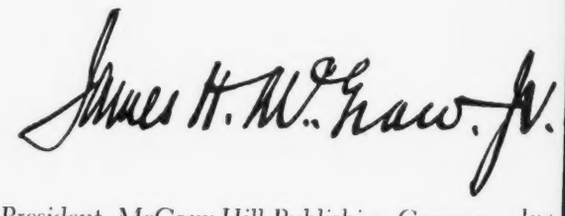
All these activities, within the United States, parallel the achievements of other industries that serve the men at the front. But construction knows no continental limits. Its men are serving throughout the network of defense bases built in the West Indies, Greenland, and Iceland, and in the offensive bases that are taking form in the jungles and deserts of Africa, the harbors of the Persian Gulf, and the plains and mountains of Australia and Alaska. Already in this war, as in the last one, construction crews, like those at Wake and Guam, have dropped their peacetime tools to fight shoulder to shoulder with their comrades in uniform. Construction follows the flag to the farthest outposts in this global struggle.

* * * *

But while the construction industry thus serves the special needs of the armed forces, it must look after its job at home. It must keep the highways serviceable, the water supply safe, sanitary facilities adequate. There are home chores that cannot be neglected even in war.

And when we finish our No. 1 task of winning the war, the construction industry will again be called upon to help re-establish peacetime employment and to stimulate the normal industrial activities of the nation. It will raze, redesign and rebuild; it will bring modern sanitation to urban dwellers; it will safeguard fertile areas and cities from disastrous floods; it will improve all forms of transportation; it will design and build the facilities that will be needed to reconvert from war to peace. Its vision, versatility, experience and ingenuity will be as indispensable then as they are vital now.

Today it is building the bases that are needed back of every battle-line. Tomorrow it will build for a new and better era. Today it is laying the foundation for the victories that must be ours. Tomorrow it will lay the foundation for the peace that will follow these victories. In war and in peace the construction industry is the builder, the harnesser of nature's forces.



President, McGraw-Hill Publishing Company, Inc.

WARTIME POWER CLINIC

Practical ways to create emergency capacity. Cures for overloads, breakdowns, short-handed staffs, lack of spare parts, etc. Contributions invited at regular rates

Temporary Repairs To Flexible Couplings

THE SKETCH SHOWS two ways to make temporary repairs on flexible-shaft couplings, of the type indicated, that have failed with stripped internal-external teeth or splines. This coupling has two hubs with external splines, one hub keyed to the driving shaft and the other to the driven. A floating sleeve with internal teeth that mesh with the external teeth of the hubs encloses both.

This coupling is an excellent piece of equipment. Where failures occur they can usually be traced to improper lubricant, loss of lubricant or excessive misalignment of the shafts.

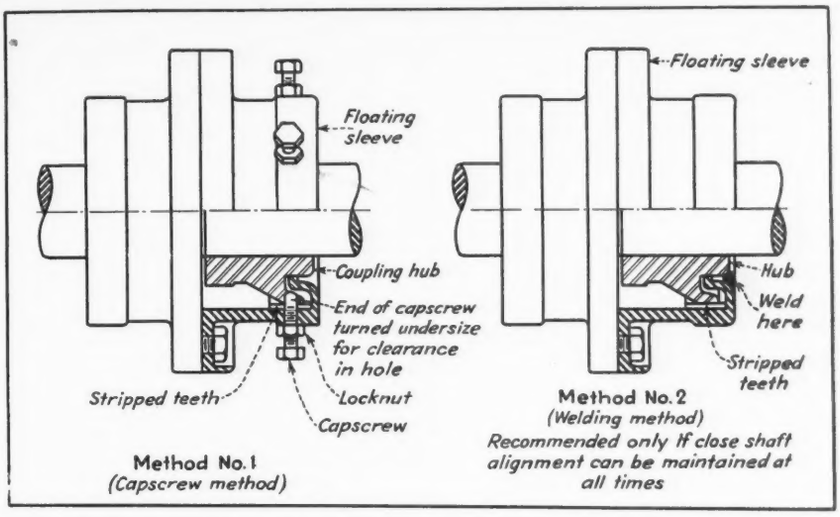
The capscrew method of repair is shown at the left in the drawing. We have used this twice with complete success on couplings connecting engines to high-pressure reciprocating plunger pumps. In each case several weeks elapsed after making the temporary repair before the unit could be shut down long enough to install a new coupling.

The repair shown does not require the removal of any part of the coupling, nor much machine work. Holes can be drilled and tapped in position with portable tools. The repaired coupling retains some degree of flexibility, and all internal parts can be lubricated as they could before.

The number and size of the capscrews required will vary with torque transmitted. If there is any doubt regarding capscrew requirements, the combined cross-sectional area of capscrews needed to carry the load can be computed from the power transmitted, rpm and allowable safe shearing stress of the steel used in the capscrews.

The second method of repair (right) is a matter of welding together the hub and sleeve carrying the stripped splines. This leaves practically no coupling flexibility. The weld must be made carefully to prevent misalignment in the coupling parts. This repair is recommended only where close shaft alignment can be maintained at all times during operation and only if a competent workman is available to make repairs. In case of doubt use the capscrew method.

Whiting, Indiana W W McCLOW



Capscrew repair (left) is safe and more flexible. Welding repair is quicker

Watch the Power Factor

HUNDREDS OF INDUSTRIAL PLANTS are today operating far above their intended output. In some districts heavy power demand has strained the capacity of generating plants and distributing systems, and has made conservation more and more essential.

Low power factor is a primary waster of generator, transformer and transmission equipment capacity. Moreover, the consumer pays a higher electric bill.

Underloaded induction equipment (transformers, motors, ac welding equipment, etc) is one of the primary causes of low power factor. Underloaded induction motors are particularly wasteful.

Why not make a load check on all motors to see how much underloaded induction equipment is in operation in your plant? Don't use a 10-hp motor where a 7.5-hp unit will do, or a 5-hp that could be replaced by a 2- or 3-hp motor.

If he will reshuffle his motors so that no machine is over motored, the plant operator can greatly improve power factor, and save substantial amounts in energy charges. Further improvement can be made if he replaces some of the induction motors with synchronous units.

Capacitors provide the third and most positive means of raising power factor. While improving power factor, the capacitor reduces line losses, cuts the kilowatt demand on the line and reduces voltage drop substantially. In one plant I installed two small capacitors at a total cost of $162.00, which increased the power factor to 94%. In 14 months the electric company had returned over $450 in high-power-factor rebate. In addition to this cash saving, voltage drop was reduced to a minimum and voltage remained fairly constant. Moreover the factor of safety on already overloaded lines was increased immeasurably.

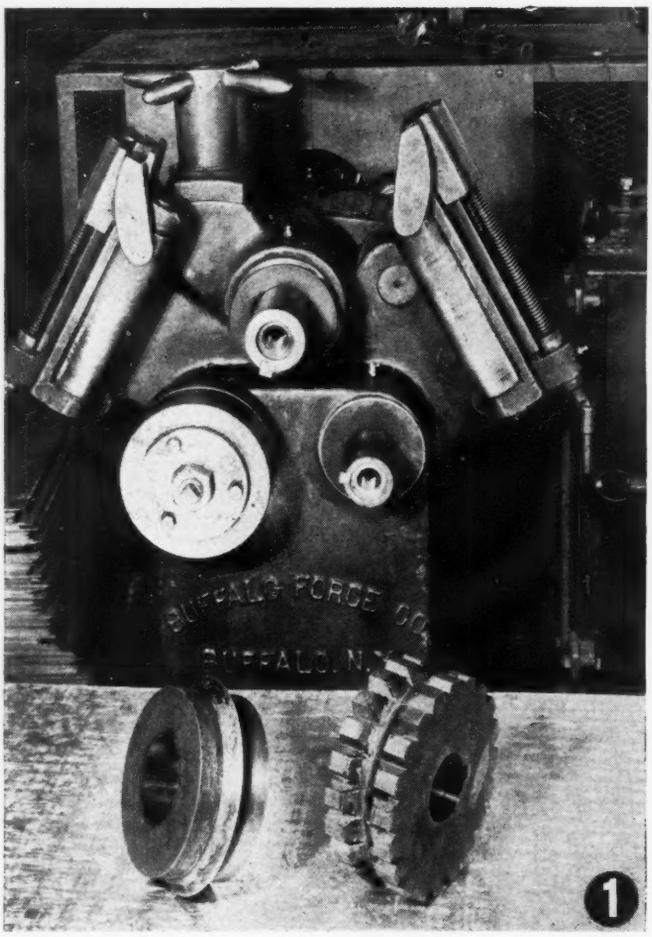
Right now many of us are unable to rewire any part of our plants and are operating at well over full load. By raising the power factor and eliminating wattless current, we can remove the straw that might break the camel's back.

Aurora, N. Y. I W DUDLEY
Chief Engineer, Wells College

Salvages Rubber with Bending-Roll Machine

LIKE OTHER LARGE CORPORATIONS, The Timken Roller Bearing Company frequently accumulates sizable quantities of scrap electric cable. Until recently it burned the rubber and cloth insulation off these cables to salvage the copper.

Seeking a method of salvaging cable rubber, Timken's conservation men experimented with a standard Buffalo bending-roll machine. This consists of three smooth wheels, two of which are in tandem beneath a third wheel cen-



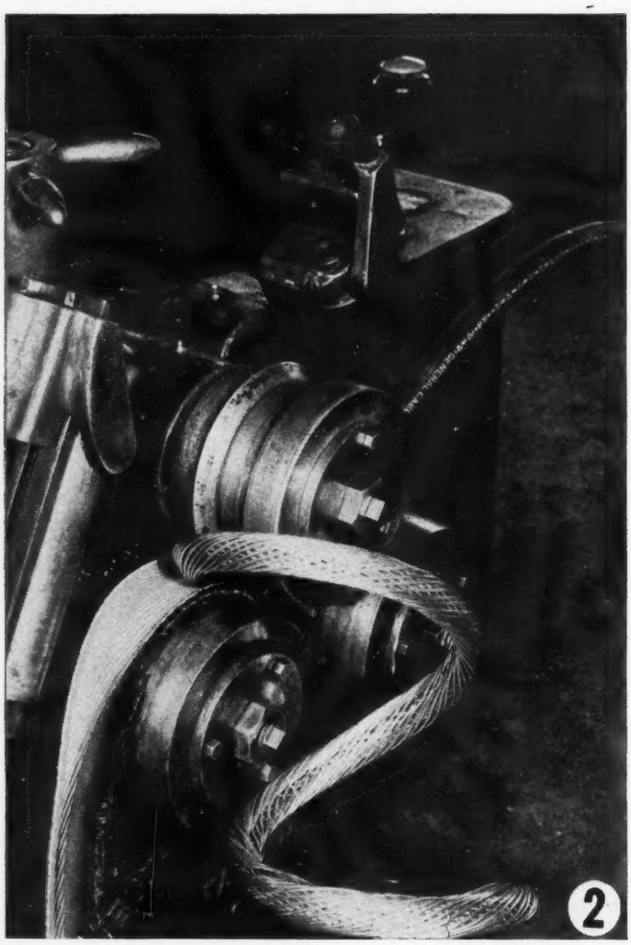


Fig. 1—Buffalo bending-roll machine with one lower wheel and upper pressure wheel removed. Rubber-salvage wheels are shown in the foreground—gripper wheel at right and cutter wheel at left. Fig. 2—Cable enters machine at right. Emerges at left as cleanly stripped cable and rubber covering, ready for salvage. Machine can be converted in about three minutes

tered above them. Varying pressures are exerted upon the material to be bent by raising or lowering the upper wheel.

The engineers removed one lower wheel and replaced it with a notched gripper wheel. A sharp center-flanged wheel replaced the upper wheel. No change was made in the third wheel. This conversion proved extremely effective in removing the outer layer of cable cloth insulation and the inner layer of fine rubber, so urgently needed at the present time. The gripper wheel feeds the cable between the flanged cutter wheel and the pressure wheel, slicing the cable open and peeling it simultaneously. The cloth cable cover drops away from the rubber, leaving the rubber and copper cable in a salable condition without further attention.

The unit salvages cable rubber at the rate of about 6 fpm. Cables ranging in size from $\frac{5}{8}$ in. to 2 in. are easily handled.

Regularly used in the sheet metal department, the machine can be converted to salvage use in about three minutes by simply replacing the two regular wheels, as described.

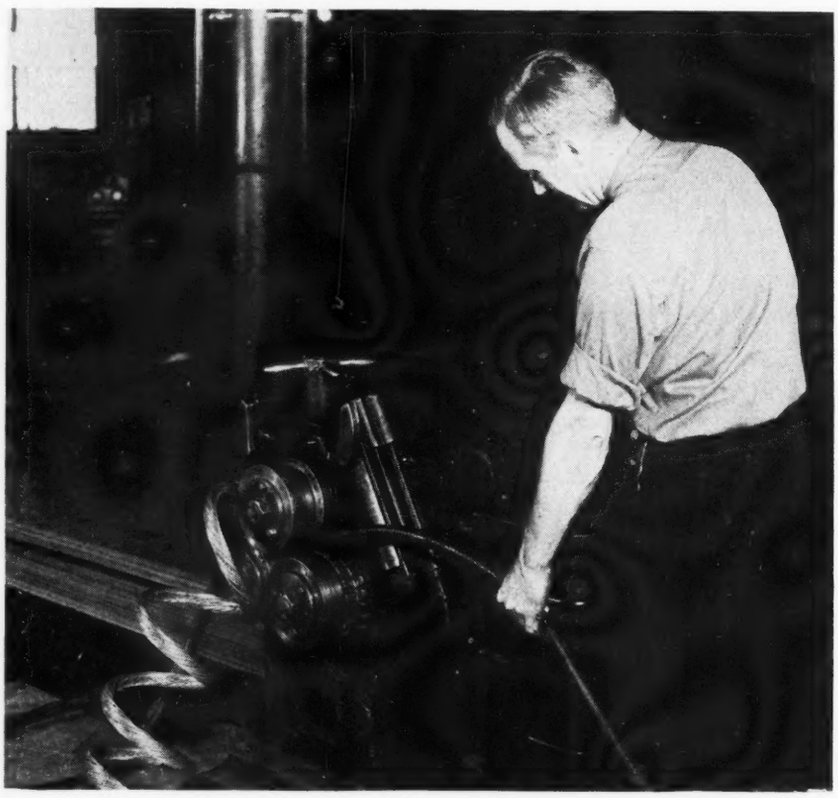
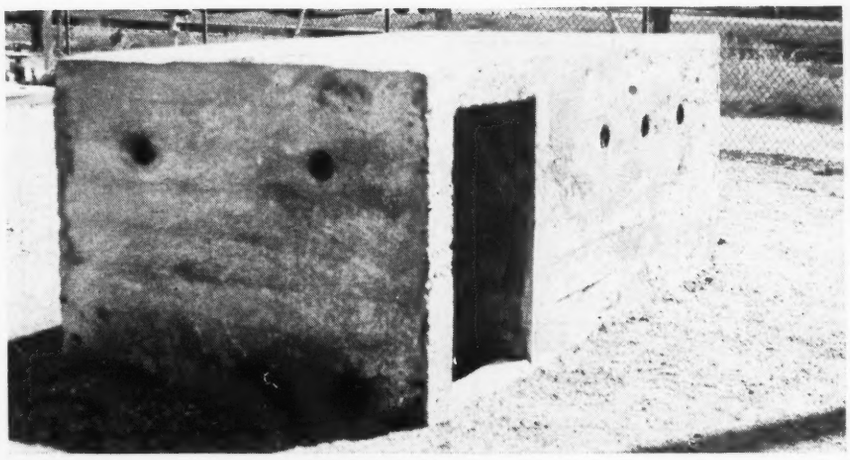


Fig. 3—Feeding scrap cable into the rubber-salvaging machine



Monolithic concrete bomb shelter, half buried in the ground, is placed at a convenient point near the engine room for employees' protection

Concrete Bomb Shelter

As PROTECTION for a small number of employees in an industrial plant situated in an area subject to potential bombing from the air, or in the midwestern area where destructive windstorms are frequent, a monolithic shelter can be built at a nominal cost when designed as what is sometimes called a "half dugout." The general plan is to excavate, at a point convenient to all employees in the plant, a rectangular hole the length and breadth desired.

The inside of the completed shelter contains concrete benches on both sides of the main room for seating the employees. Entrance to the shelter room is by way of concrete steps poured as a unit with the remainder of the shelter and separated from the main room by a substantial wall. The second door is placed at the bottom of the stairs in the wall opposite the entrance door.

Ventilation is provided by several 3-in. pipe nipples placed in the forms when pouring the concrete, near the roof so that bomb splinters entering the openings will not strike the head of a person seated in the shelter. The overall size of the shelter should be held to a minimum to reduce the visibility from the air. Obviously the entrance door is quite small, requiring a man to stoop when entering, but sufficient space is built into this shelter illustrated to seat at least eight persons comfortably.

Santa Monica, Calif. J C ALBRIGHT

Breaking in the New Hand

IN THESE DAYS the loss of a well-trained boiler operator is almost as serious as a bad breakdown of vital equipment.

I recently had to replace one of my regular men with an absolute greenhorn. All he knew about a boiler room was that fire applied to water makes steam. His mechanical ability was an unknown quantity. I had to try to make a fireman of him in one week.

First I gave him a pad and pencil. Then I showed him the feed line entering the boiler and told him to trace out and sketch the feedwater back to its source through the feed lines, pump, deaerating heater, receiving tank, to the makeup water supply.

While tracing the lines, the man got to know their location and purpose. It took him only an hour to make this sketch. When he finished he knew just how important it is to keep water in the boilers and how to get it there.

Next I had him sketch the continuous-blowdown and the heat-exchanger system. In this way he learned its function more thoroughly than if I had tried to explain it. The purpose of the water column and gage glass came next. After that he sketched all condensate return lines entering the plant and running to the receiving tank.

Time is precious nowadays, so why not start your next greenhorn by having him draw pictures instead of talking yourself blue in the face?

Aurora, N. Y. I W DUDLEY
Chief Engineer, Wells College

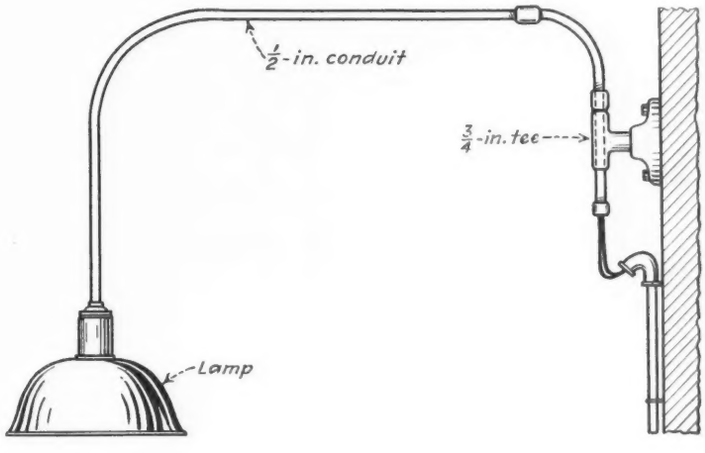
(Whether it's the college atmosphere around Mr Dudley or not, we can't say, but it's certain that he's discovered the secret of sound teaching. The great teacher leads a man into situations where he finds things out for himself. He doesn't just talk at the student. Finally, every practical psychologist knows that if you dig the facts out for yourself and make a sketch, you learn more surely and don't forget.—EDITOR)

Swinging Bench Lamp Made of Conduit

PROPER LIGHTING of work benches offers many problems, but we think we have done a pretty good job at solving ours with a swinging bracket lamp, as indicated in the diagram. The swinging bracket is made entirely of conduit carried on a pipe flange on the wall above the bench at a proper height. A short ¾-in. nipple threads into the flange and supports a ¾-in. tee with its through part vertical.

A piece of ½-in. electrical metal conduit, bent at a right angle, supports the lamp and its shade at one end and the other end connects to a 90-deg elbow. From the lower end of the elbow a short section of ½-in. conduit extends down through the tee and has a bushing on its free end to protect the wires against abrasion. A snap switch in the lighting circuit on the wall back of the bench permits turning the lamp on or off at will. The lamp is located about 6 ft 6 in. above the floor and when at right angles to the wall hangs directly over the vise or the bench. It can also be swung to any convenient position either side of this location. The lamp is rugged, can be placed where light is needed on the bench without the inconvenience of flexible extension cords.

New York, N. Y. P E MEREDITH



Emergency Threading of Pump Deckplate

CORRODED THREADS in the discharge deckplate of the liquid end of one of our large duplex steam pumps caused a discharge valve to jump out of its seat in the deckplate. With no available lathe big enough to swing the large deckplate, I rigged up a radial drill press as shown to rethread the valve-seat opening.

Chasing bar *A* was a piece of 3-in. pipe threaded at the lower end to the same pitch as the threads of the valve seat. The upper end was tapped for six set screws to lock it to the drillpress spindle. Tool holder *B*, consisting of a 4-in. long piece of 1-in. round cold-rolled steel, was made as shown in the detail of the drawing and then welded to the chasing bar. Next we bolted to the drill-press table a piece of strap steel *C* provided with a threaded hole to fit the threaded end of *A*.

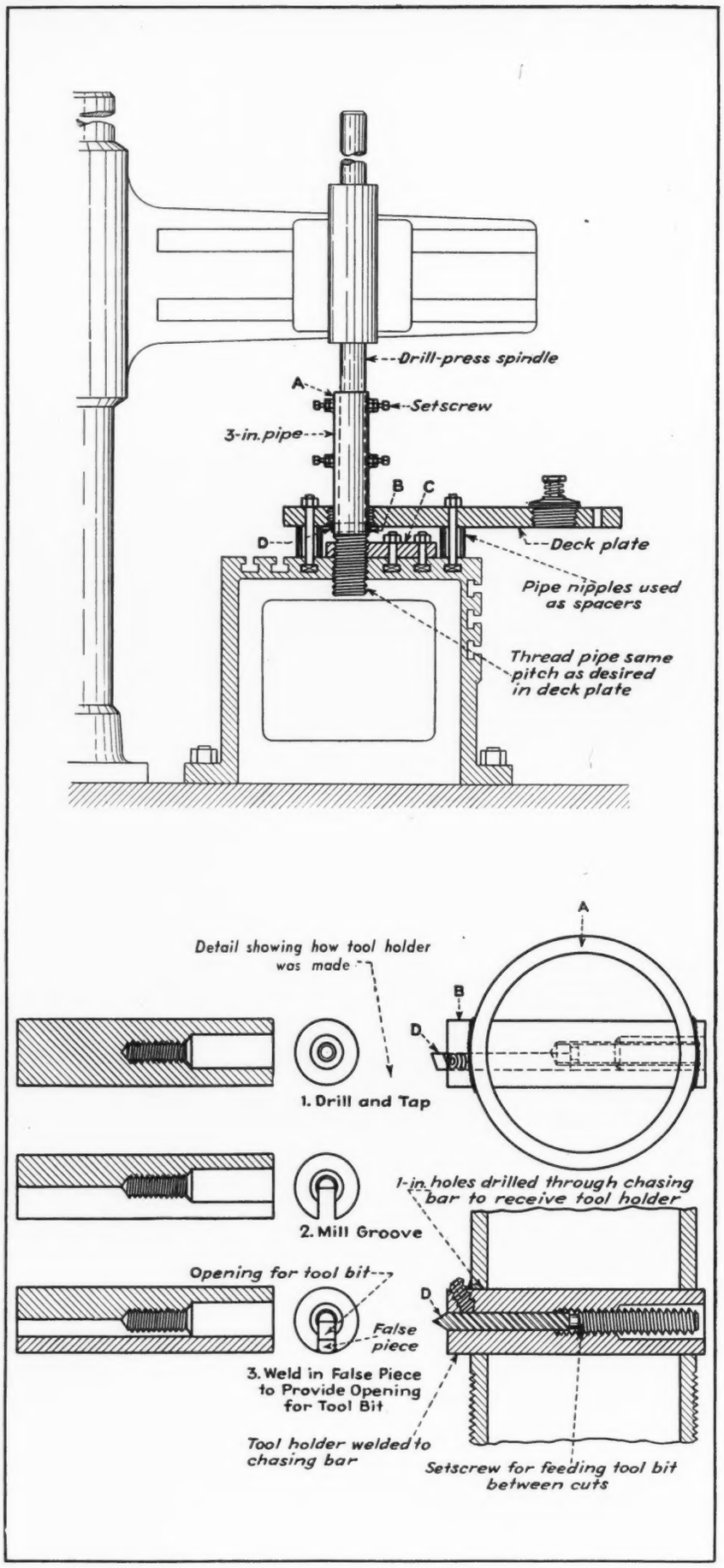
With the deckplate in position on the drill-press table, and the lower end of *A* engaging *C*, the chasing bar acts as a lead screw while the drill-press spindle revolves with all its machining feeds disengaged. As *A* revolves in *C* it feeds downward, causing the tool-bit *D* to cut a thread of larger diameter, but of the required pitch, in the deckplate.

Reversing the spindle of the drill press causes *A* to feed upward, raising *D* above the seat in the deckplate. The machine is then stopped and forces *D* outward approximately 0.005 inch tightening the backstop set screw in *B*, for the next cut.

Only a few cuts were necessary to produce a full thread. Compressed air blew the chips away while the cutting was in progress. With the aid of the pipe-nipple spacers between the deckplate and the machine tables, the deckplate was easily brought into correct position for matching its old threads with the point of the tool bit.

We built up the matching threads on the outside of the discharge valve by brazing and then recut the threads in a lathe to fit those in the deckplate.

Philadelphia, Pa. EMIL WITTMANN



Pipe A, threaded at bottom, feeds tool D to rethread seat opening in pump deckplate

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$13 per Kwhr

Rationing of electricity, instituted in Japan October 1, according to an enemy broadcast from Berlin recorded by the government, limits household consumption to 20 kwhr monthly. Where the consumer uses more than the maximum, the rate will be 50 yen (about $13, normally) for each extra kwhr.

Vertical Turbine Pumps Adapted To High-Head Water Works

Two 7-stage 6,000,000-gpd, 371-ft-head vertical turbine pumps, driven by 500-hp synchronous motors with an over-all motor and pump efficiency of over 80%, replace old steam-driven units serving municipal water supply

By J GIL DAVIS
Director of Public Property
Newport, Ky.

▶ SEVENTY YEARS AGO the City of Newport, Ky., built, as part of its water system, a steam-driven pumping station on the Ohio River. At that time it was the most modern pumping plant along the river. After the use of several steam pumps a 5,000,000-gpd vertical triple-expansion unit was installed in 1909, and in 1925 a 6,000,000-gpd steam-turbine-driven 3-stage centrifugal pump was added. In 1940, because of the age and condition of these pumps, and of the old boilers, it was decided that it would be economical to scrap this equipment and install modern motor-driven vertical turbine units.

Today this plant is again one of the most modern along the Ohio River; only the old building remains. The new pumps, weighing about 30 tons including all auxiliaries, have about double the operating capacity of the old units, which weighed approximately 200 tons.

Equipment Arrangement

Fig. 2 shows a plan of the old wet and dry wells with the location of the new pumps and piping. An elevation through the wet and dry wells, Fig. 3, indicates the arrangement of the pumps, motors and piping. The old vertical steam pump was installed in the wet well from which it lifted the water and the turbine-driven pump was placed down in the dry well. Two original river intake pipes entering the rear of the wet well are still used. The new pumps take their suction from the front of the well so that it serves as a desilting basin with about 2 hr retention of the water with the pumps operating. From the wet well the suction line runs through an Elliott twin strainer and to a header to which the suctions of the two pumps connect.

Several factors had to be considered when selecting the new equipment and Pomona Pump Co water-lubricated turbine-type pumps were chosen as being best suited to the city's requirements. Because of the condition of the 24-in. pressure-discharge line and the 20-in. gravity main from pump house to filter station, it was not known how much water could be pumped efficiently through the lines. This was true not only because the discharge line had been in service for several years, but because of a dip in it where it was strongly suspected that sediment restricted the flow.

Fig. 1—These 500-hp, 900-rpm hollow-shaft synchronous motors are set 70 ft above the high-lift 7-stage turbine pumps on the water-supply system

A feature of the new pumps with semi-open impellers provides for a capacity reduction to about 60% normal by raising the impellers. Fig. 5 shows a cross-section of a pump of similar design. Clearance provided in the pumps at *A* and *B* permits runners to be lifted to increase impeller clearance at *C* and reduce pump capacity if desired after installation.

On the initial test of our pumps we found that the filter-bed capacity had been reduced in 15 years of service and the beds could not handle 6,000,000 gpd of water. This amount of water was also excessive for the main. For these reasons the pumps are running

with their runners lifted slightly to give approximately 5,300,000 gpd with nearly full-capacity efficiency.

A major consideration in the selection of these pumps was that the Ohio River not only contains considerable silt and abrasives which erode pump parts and reduce their efficiency, but the little Miami River empties into the Ohio opposite the pumping station and aggravates the silt problem. Using semi-open impellers with mixed-flow characteristics gives lower velocities through the pumps than straight centrifugal designs. Erosion from silt, because of lower flow velocities, should be considerably less in the semi-open impeller design than in a centrifugal unit. To increase the life of the pump further, a speed of 900 rpm, one-half the conventional speed, was selected.

A special feature of these pumps is the bulbous shape of the advance ends, the first to contact the fluid, of the diffuser vanes between stages, Fig. 4. This reduces the tendency for turbulence and eddy currents to develop in the fluid as it is directed upward through the passages between the vanes, to the point where it approaches the condition indicated in the figure. As a result fluid flow has the correct direction to enter the next impeller, and efficiency is increased.

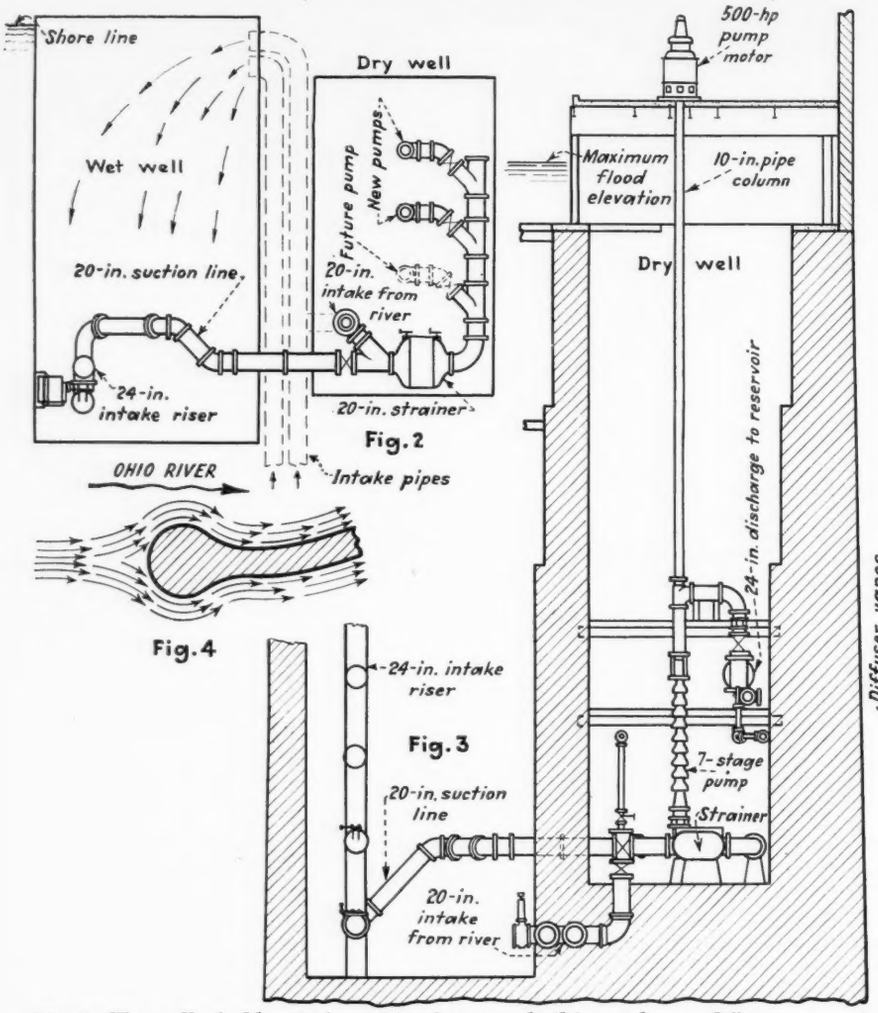
These pumps are 7-stage 24-in. medium-capacity units, designed for 53 ft per stage, or a total head of 371 ft. They are driven by 500-hp unity-power-factor, 2300-volt Westinghouse synchronous motors, Fig. 1. Each unit, motor and pump, has an over-all wire-to-water efficiency of over 80%. Because of the pump design it is expected that this efficiency will be maintained over a long period, keeping operating cost to a minimum.

Because of the vertical design, each pump, exclusive of switchgear and accessories, occupies a floor space of only 36 sq ft. Provisions for the installation of a third unit have been made, as shown in Fig. 2, if this becomes necessary. From motor base to bottom of pump assembly is approximately 70 ft and an elevator in the dry pit is part of the station equipment. Motors and switchgear are mounted nearly 4 ft above the crest of the 1937 Ohio River flood so as to insure continuity of operation during heaviest flood stages.

Other features contributing to the plant reliability include duplicate incoming power lines. Normally these pumps operate with zero suction lift, but equipment to prime them if the river level drops below their lowest impeller stands ready.

The motors start on full voltage and have hollow shafts. The pump shafts extend up through the motor shafts and connect to them at their top ends. At the top of the pump shafts a nut provides for vertical adjustment of the pump impellers in their bowls. An oil-lubricated, self-aligning, anti-friction thrust bearing, set on the upper bearing bracket of each motor, carries the total thrust load of both pump and motor rotors.

The upper anti-friction guide bearing, located above the thrust bearing, is lubricated from the water-cooled oil reservoir in which the thrust bearing is submerged. The lower sleeve-type



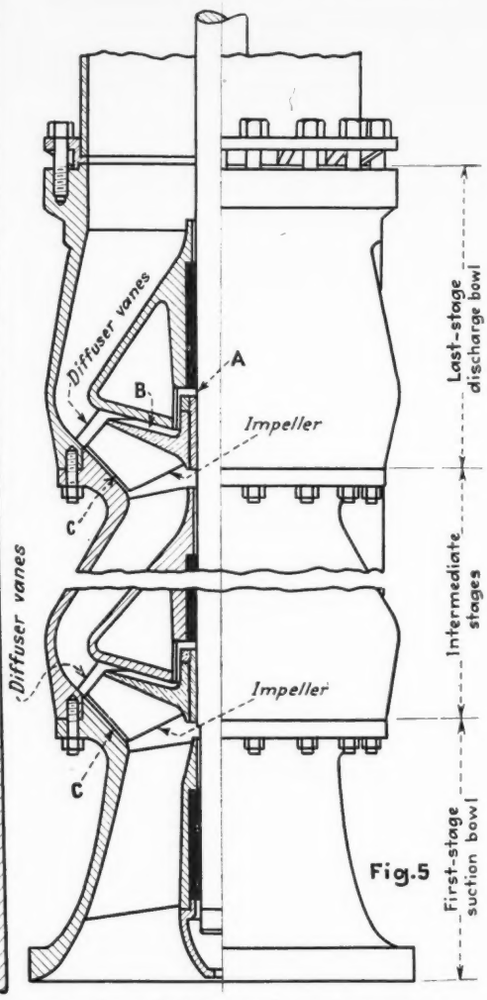


Fig. 2—Wet well of old pumping station becomes desilting and suction basin for new pumps. Fig. 3—Pumps installed in the dry well have their driving motors and control panel located 4 ft above maximum flood level. Fig. 4—Advance ends of diffuser vanes in pump have bulbous ends to improve performance. Fig. 5—Clearance at *A* and *B* permits lifting the pump impeller to adjust discharge without throttling by increasing the clearance at *C* between the runners and bowls

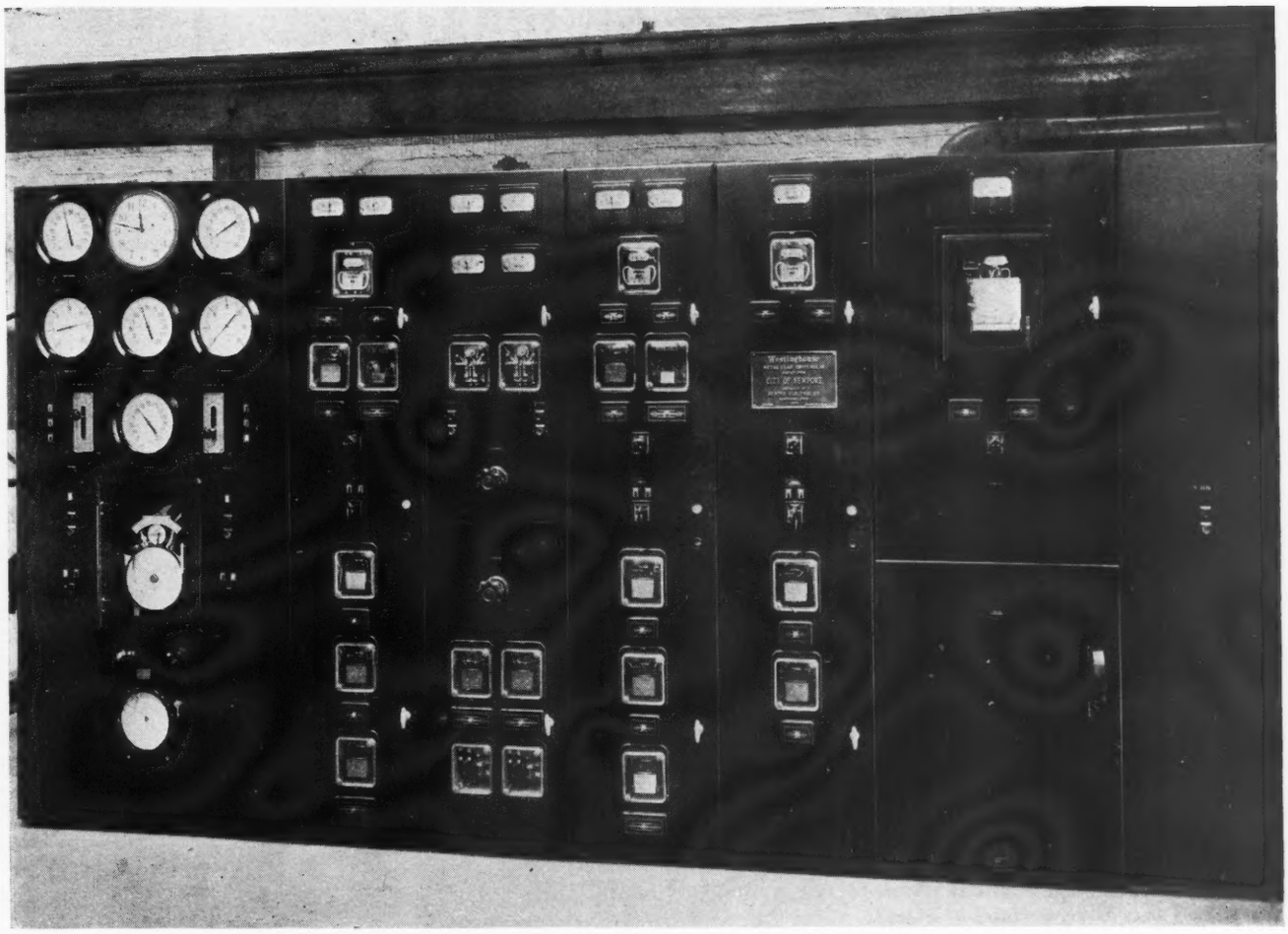


Fig. 6—Hydraulic and electric controls for the pumps, their motors and auxiliary equipment are mounted on this panelboard

guide bearing, partly immersed in the lower oil pot, has an air bypass to prevent oil being drawn into the motor windings.

Non-reverse ratchets mounted just above the lower guide bearings prevent the pumps driving the motors in reverse if power fails. These consist of a stationary ratchet plate with 13 teeth and a rotating plate having three pawls to engage the teeth. When the motor starts in forward direction centrifugal force throws the pawls out against a retaining ring and friction against this ring holds them horizontally out of engagement with the teeth. Combinations of three pawls and 13 teeth limit any possible reverse rotation to one thirty-ninth of a revolution before the pawls engage.

Semi-automatic in operation, complete control of the station is from the switchboard on the operating floor. When a pump is started from a control switch a hydraulically operated cone valve, between pump discharges and water main, opens automatically as discharge pressure increases and closes automatically by reverse operation. Provisions are also made so that if a pump stops when an attendant is not around the cone valve closes in 7 to 10 sec on reverse flow, keeping the discharge line full.

Fig. 6 shows the switching and control panel. Beginning at the left, the first panel mounts the hydraulic control and gages; panels 2, 3 and 4 are for the two 500-hp motors and their exciters; panel 5 is for auxiliary power control; panel 6 controls the 750-kva 2400-volt 3-phase, incoming power circuits for the pump motors and a 3-kva 2400-to-240-and-120-volt control transformer bank; and panel 7 is for low-voltage distribution units. Oil circuit breakers have rectox-operated closing solenoids and capacitor trips.

Starting A Pump

With the exciter and other auxiliary equipment in operation, a pump is started from a control switch on the panel board, which first causes a tank of water to flow through the water-lubricated bearings of the pump to insure proper prelubrication. A relay and float switch arrangement causes the tank to fill and operate a float switch. This switch energizes a relay and a solenoid valve to permit the water to flow through the bearings. When water level in the tank has lowered a predetermined amount, a low-level float switch closes a second control relay which completes its holding circuit through the control switch and closes the solenoid-operated oil circuit breaker to start the pump motor on full voltage. A motor-operated time-delay relay energized through an auxiliary contact of the oil circuit breaker permits the motor to accelerate as an induction motor to approximately synchronous speed before the timing relay closes to energize the field contactor and excite the motor field poles.

Many benefits have been derived from the new installation. The use of electric motors saved the city the cost of new boilers, cut down the number of attendants necessary to operate the plant, and gave additional space. Because of the increased capacity of the pumping units, the reservoir and filter beds can be completely filled and the pumping plant shut down over Sundays and holidays. Incidentally, employees from the old pumping plant not employed in the new station have been given work elsewhere in the city, as is the usual practice when carrying out modernization programs.

Fire Hose Sluices Coal to Emergency Storage

Ingenious use of readily available materials, costing less than $100, extends conveyor system at Illinois Iron & Bolt Co plant for quick and easy piling of emergency coal

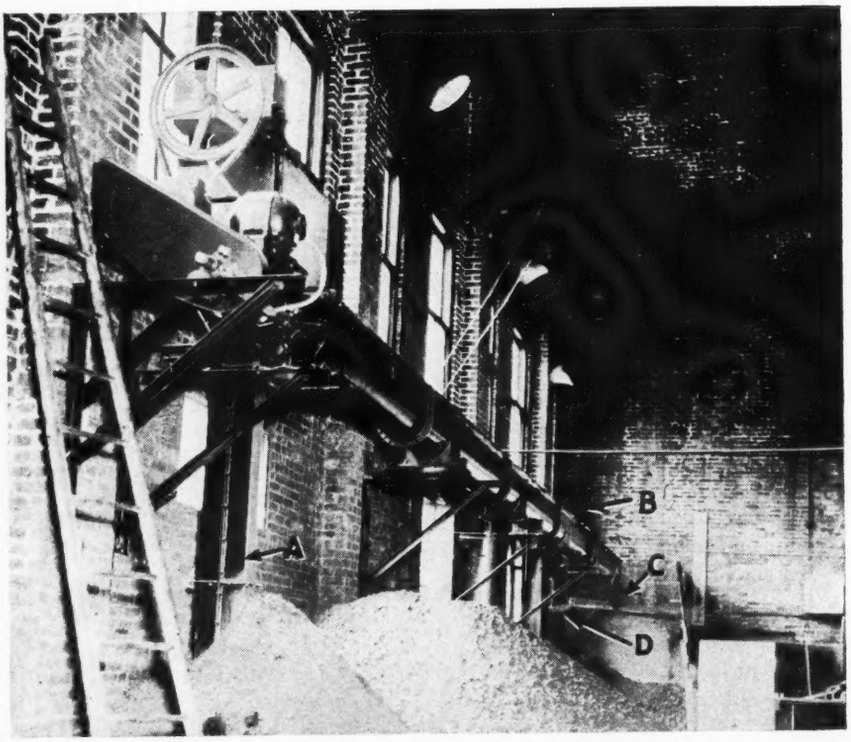
▶ A PUMP, FIRE HOSE and some 6-in. galvanized leader pipe, materials that were on hand or were quickly obtainable locally, solved an emergency coal-handling problem at a cost of less than $100. The installation, pictured on this page, was made at the Illinois Iron & Bolt Co.'s plant, Carpentersville, Ill. Factory, power plant and railroad siding are located alongside the Fox River.

Until less than a year ago, about 12 tons per day of 1¼-in. screenings, for the two 4000-sq-ft boilers, were hand-shoveled from flat-bottom railroad cars through windows in the adjacent boiler-house wall to the floor in front of the boilers. A long stride forward was taken when this slow, laborious process gave way to a modern conveyor system.

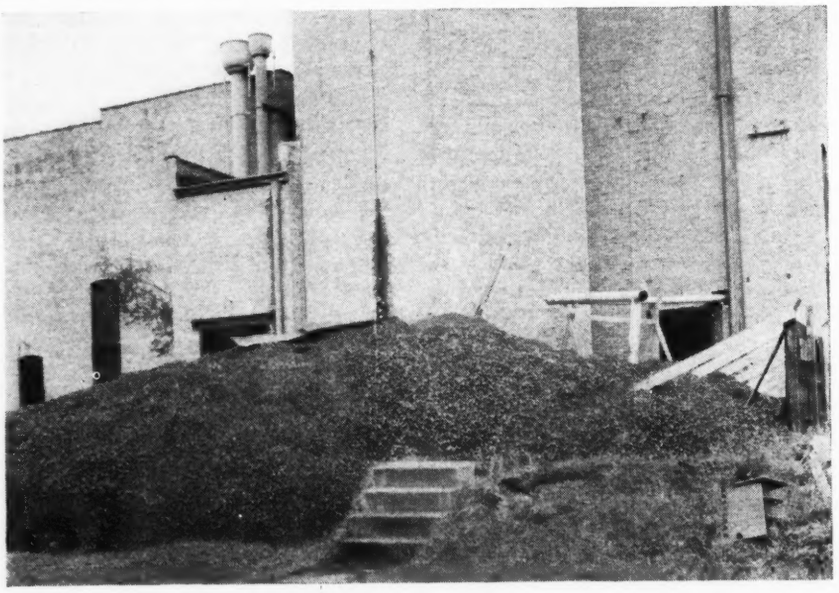
Now hopper-bottom cars discharge to a track hopper which feeds a Link-Belt L-path Bulk-Flo elevator. The elevator conveyor carries the coal through the boiler-house wall and raises it vertically to a horizontal screw conveyor for distribution along the length of the boiler room.

Hardly was this installation completed when the "stockup" campaign began and it became desirable to build an emergency coal-storage pile. The best available site was just outside the boiler house at the far end. The screw conveyor could have been extended through the boiler-house wall to deliver coal to this pile but this would have required additional conveyor equipment and supports.

To save as much critical material as possible and to keep investment to a minimum, the Illinois Iron & Bolt engineers arranged to pump water from the Fox River through a fire hose connected into a section of leader pipe at a point just back of where the coal enters the pipe from the last gate in the screw-conveyor trough. The hose stream sluices the coal through the leader pipe to the storage space outside the boiler house; changing the direction of the pipe permits building up the storage pile at any desired location.



Boiler-room view shows up-run of L-path elevator conveyor *A* which raises coal from track hopper to horizontal screw conveyor *B*, with hand-slide discharge gates at intervals. Coal from end gate drops into leader pipe *C* which passes through boiler-house wall. Fire hose *D* sluices coal through pipe to storage pile in yard



Relocating leader pipe permits sluicing coal to part of pile to be built up

THE OPERATING ENGINEER

George Edwards
Advisory Editor

PRACTICAL AIDS • MAINTENANCE HINTS • QUESTIONS—ANSWERS

PUBLISHED MONTHLY AS AN INTEGRAL PART OF POWER

How to Install Boiler Tubes

When boiler tubes fail quick repairs require ingenuity and skill to return the unit to service with a minimum of delay. E J Duff describes practical methods that save time and make otherwise hard jobs easy

POWER-DRIVEN EQUIPMENT is useless if the boiler plant cannot supply enough steam to meet the load. The loss of only one boiler can reduce power output and seriously hamper production schedules. Outage time can be shortened by developing and using time-saving methods of installing and rolling boiler tubes. Each boiler has its own peculiarities; these must be studied, because they affect the ease with which repairs can be made. (See "How to Remove Boiler Tubes," this issue, page 121.)

Many things must be taken into consideration when a tube fails. The first and foremost is, can the remaining boilers carry the load? If so, the damaged unit can be taken out for immediate repairs. If the boiler cannot be spared, it must continue in service until the load drops. Naturally the boiler cannot remain on the line if the tube leak causes a serious steam loss. In this case the boiler must be cut away from the system to prevent pressure loss.

Perhaps the leak, although not immediately serious, may be in such a location that if it results in a tube rupture, whipping action will destroy brick or baffiework. When this happens additional outage time is required to install new refractory material.

Fortunately, failures usually occur in the outer rows, where the tubes are exposed to the hottest gases, and are also the most accessible.

Plants having a welding and burning outfit can burn out the bad section and weld in a new piece quickly. When this equipment is not available the entire tube must be removed and a new one inserted. The small plant often lacks welding equipment; the methods suggested here will help to speed up tube replacement.

When heavy and cumbersome tubes must be inserted and held in place until one end is belled slightly, usually with a hammer, the crimping tool, Fig. 2, will do the job quicker and

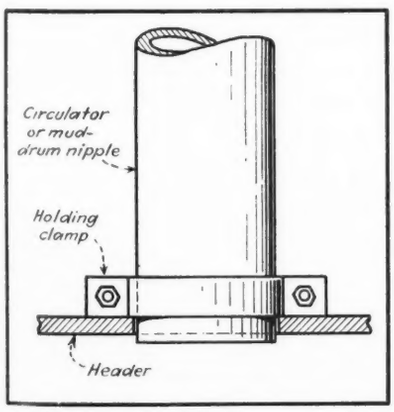


Fig. 1—A strap-iron clamp for holding circulators and front or uptake nipples

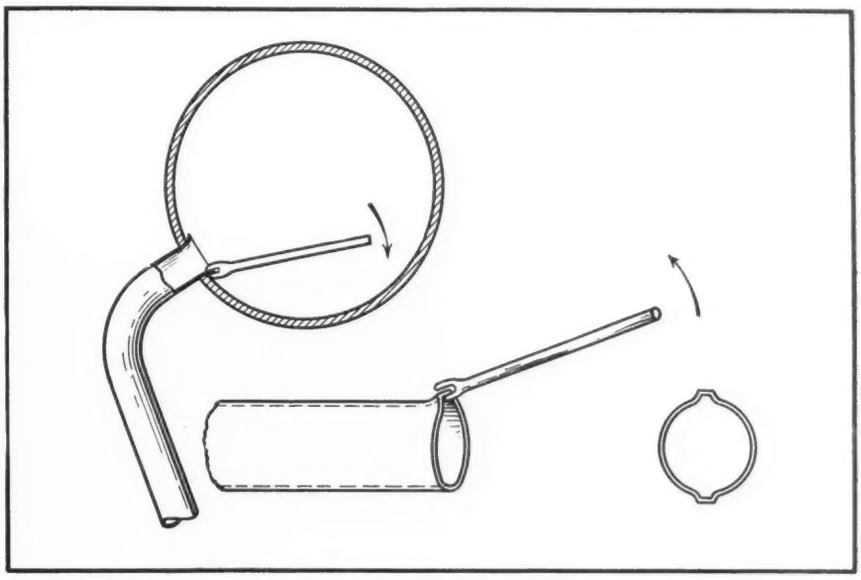


Fig. 2—Crimping tube ends with a bar is much easier than belling with a hammer

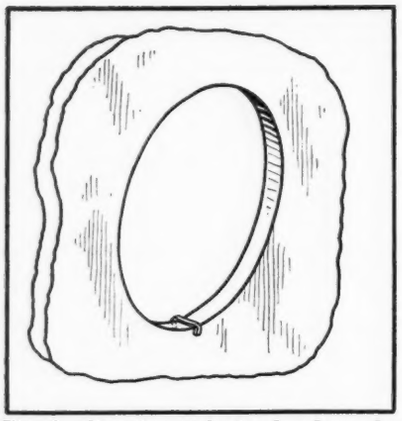


Fig. 3—Repair notched tube sheets by inserting a nail or copper rod in groove and hold by bending the ends

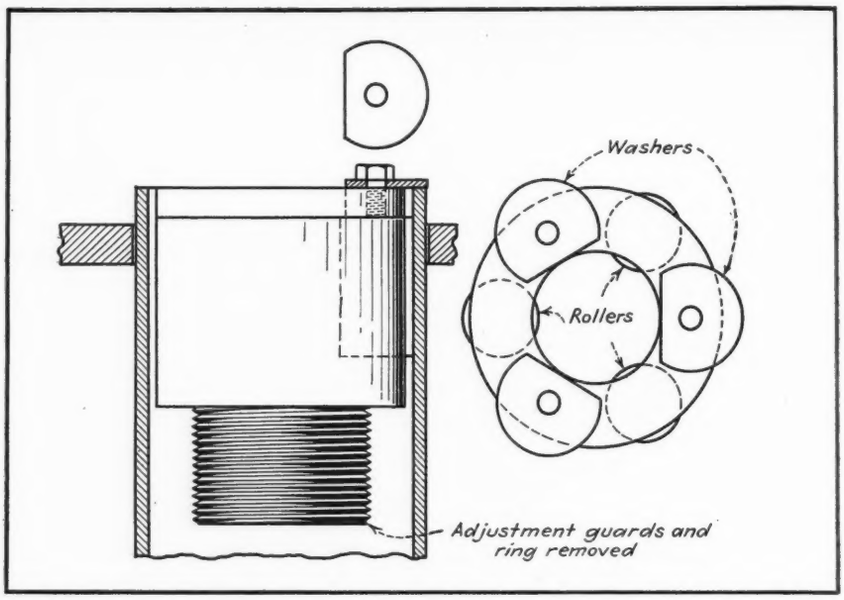


Fig. 4—Remove guard and attach holding washers to roll mud-drum nipples

with less shock to the man holding the tube. The tool edges are rounded to prevent nicking the tube. Only two or three crimps are needed to hold the tube in place. A moderate crimping of straight tubes permits passage past the cap holes yet prevents the tube from sliding through the tube header. A clamp, Fig. 1, holds a circulator or front uptake nipple in place for the expanding operation.

Reduce Clearance With Shims

Clearance between the tube and tube hole can be reduced with packing-crate band iron inserted as shims. These will serve just as well as copper ferrules. Use a pipe mandrel, slightly smaller than the tube, on which to form the band to a circular shape, while hammering the overlapping ends to a taper joint.

Tube seats are sometimes accidentally cut with the ripping tool when a tube is removed. Nails or copper rods shaped to fit the groove can be inserted and held in place, Fig. 3, by clamping the ends to the tube sheet. Expanding the tube against this filler closes the opening and prevents leakage through the groove.

During the installation of mud-drum nipples the expander sometimes hits the curves of headers, preventing it from entering the nipple. To overcome this remove the upper guards, fasten washers on the bottom of the expander and insert it in a reversed position, Fig. 4. The expander bottom is generally about $\frac{3}{8}$ in. thick. This brings the rollers in place for expanding. If this doesn't work, insert the expander upward from the bottom through the mud drum using a short $2\frac{1}{2}$-in. pipe nipple and coupling as a jack to adjust for height. The coupling will fit over the expander end after the guards are removed, Fig. 5. When all mud-drum nipples are being renewed and working space in the rear is limited, the two rolling methods illustrated in Fig. 6 may be used. One is accomplished with the circulators removed and the other with the circulators in place.

Guides for Jointed Mandrel

The mud-drum nipples can be expanded from the top of each header section or from the boiler drum. Mandrel rods made up of jointed sections long enough to be inserted easily will speed up the work. Circular wooden bearings, split in half and inserted in tube or cap holes, serve as guides for

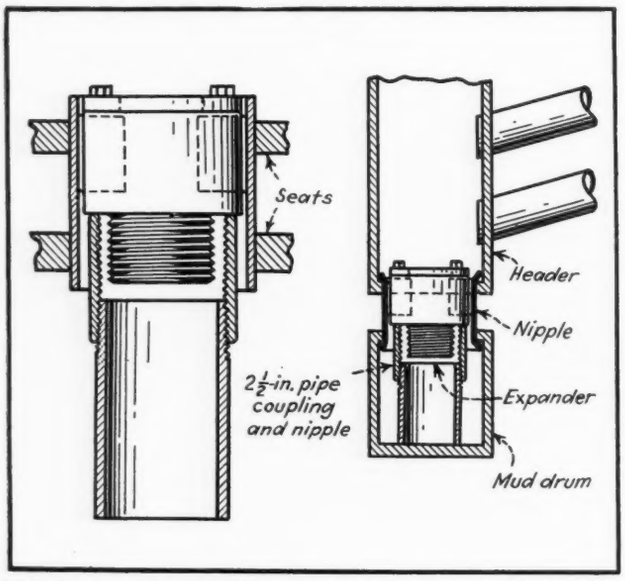


Fig. 5—Iron pipe coupling and nipple used as a jack with expander inserted from mud drum furnishes adjustment

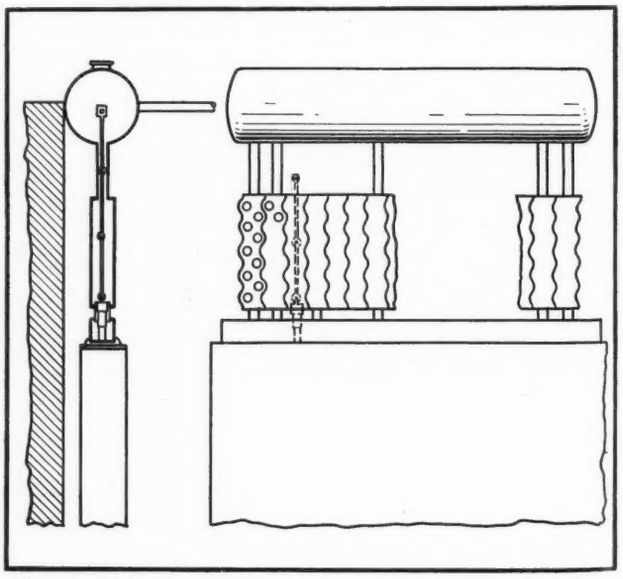


Fig. 6—Jointed mandrel for operating expander from boiler drum or above tube header held with wood guides

the mandrel during rolling operations. With this arrangement one man remains in the drum to do the rolling while another stationed below guides the mandrel and changes the expander.

A supply of blind nipples provides additional security against prolonged delays. Make these from good sections of old tubes by closing one end with a cap. Before using any improvised nipples, have them inspected and approved by a boiler inspector.

These emergency repairs serve when spare tubes are not available and permit operating the boiler until new ones can be secured. When blind nipples replace tubes that pass through a baffle, the baffles hole should be plugged with suitable material until a full-length tube is inserted.

Cleaning cap and cap-hole faces can be speeded up with a motor-driven facer, as shown in Fig. 8. Elaborate grinding outfits are unnecessary. A light-weight motor fitted with an emery-faced disk serves for both caps and cap-hole faces.

Roller Impressions

The use and value of different shaped rollers, Fig. 7, has always been a controversial question. Tapered rolls have their field of usefulness and give good performance in belling or flaring the tubes. It is a common belief that placing tapered rolls with the larger end of roll to the smallest taper of the pin causes one to neutralize the other and make a straight expanded joint. Theoretically this seems true, but on cast headers where the cast iron is harder than the tubes, it results in an expansion similar to *A*. On steel headers and especially on the cross-box of long-drum boilers with steel-to-steel contact, over-expanding with tapered rollers causes a pronounced beveling of the seat, *B*.

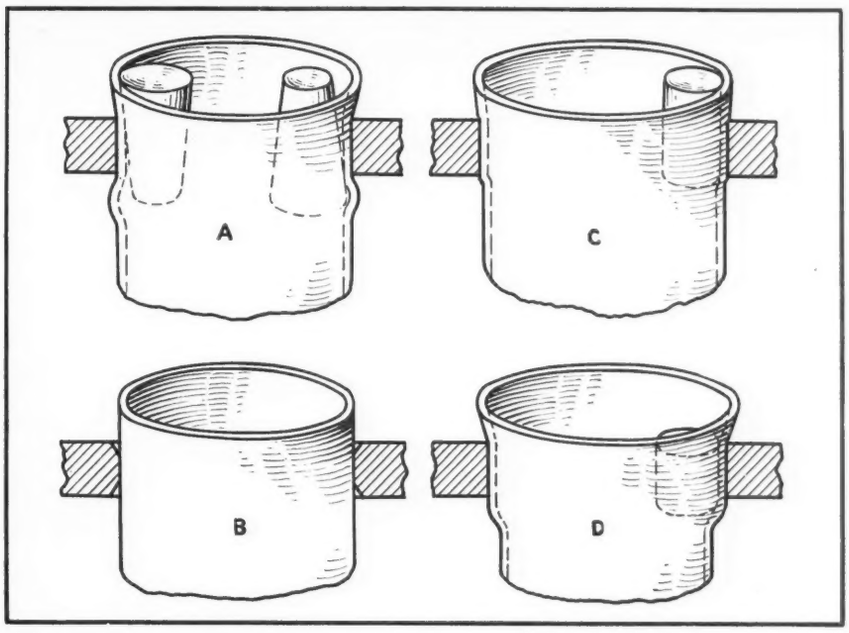


Fig. 7—Tube expansion depends on roller shape and bearing position at seat

Good joints can be secured by proper placing of the rollers; in other words, correct adjustment of expander guard or adjusting collar. For instance, the length of the rolls in a 4-in. expander is about 1¼ in. Assuming a boiler with ½-in. tube sheets, a tapering effect will result by holding the roller high, about ⅛ in. back of the seat. This can be demonstrated by removing the expander still further, say ⅛ in. outside the tube end. With this adjustment, straight rolls can be used to bell or flare the tube after expanding, simply by rolling around lightly, the taper of the mandrel causing this. The result of high rolling with its resulting tube flare is shown in *C*.

Careful Expanding

On the other hand, adjusting the expander to project ⅜ in. past the seat, *D*, produces a good job, after which the tube can be flared as required. Expanding tubes requires practice and experience to know when rolling should be stopped. Excessive rolling will damage the tube, and with cast iron headers, will cause the added expense of a cracked header.

Tubes, such as end circulators, in inaccessible locations, and mud-drum nipples present the most difficult rolling problems. Study your particular boilers and provide tools that will simplify the difficult jobs and reduce the time needed to make repairs.

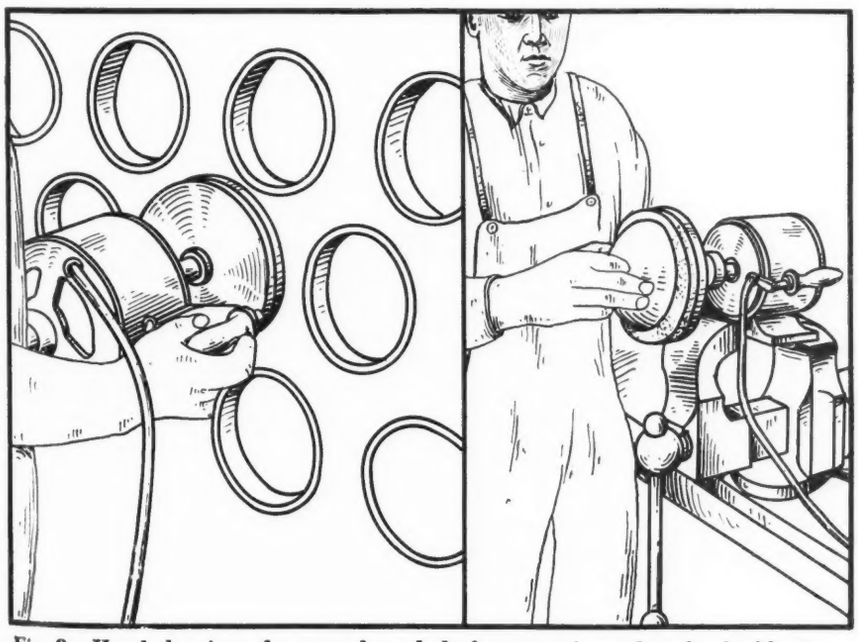


Fig. 8—Hand cleaning of caps and cap-hole faces requires a lot of valuable time; use a portable power-driven grinder made from a small motor and emery disk

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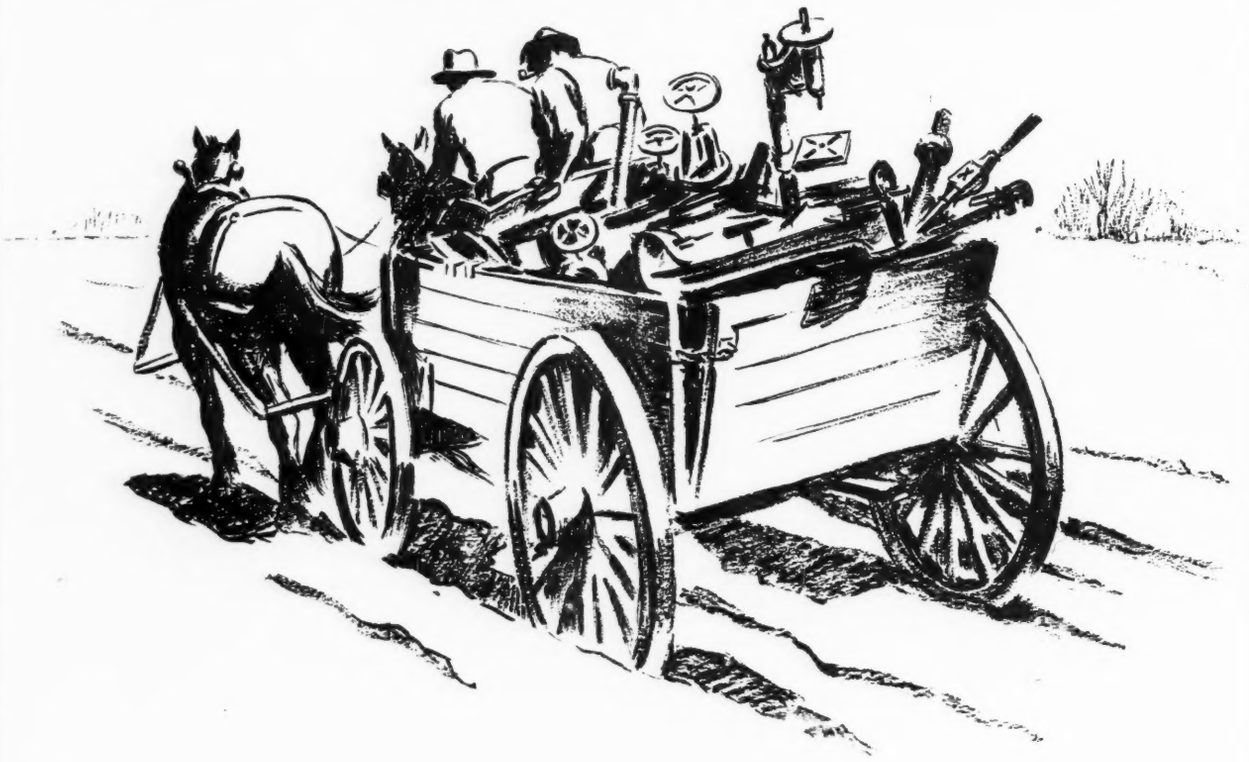
Safety Note

When the safety valve on a boiler is set at a pressure higher than 250 psi, under the ASME Boiler Code (the accepted standard in the majority of states and cities having boiler laws) it is not permissible to change the setting of the valve, by adjusting the spring tension, more than 5% above or below the pressure for which the spring was designed.—*The Locomotive.*

Dick and Andy

AND

THE UPSIDE-DOWN BOILER



In this bit of reminiscence, Jos W Hays, pioneer in combustion and boiler-room instrumentation, tells a strange story of engineering in the Gay Nineties, with sidelights from the author's early days on the farm and in the printshop

THIS IS A STORY that I have wormed out of Dick Potter and Andy Corcoran of Springfield, Ill.—octogenarians who have spent practically all of their active lives in boiler shops. Much to their disgust, they are now on the retired list. If I am not mistaken, they have just about broken all records for continuous work in boiler shops.

Dick for many years has been superintendent of a boiler shop and Andy has been layout man—a very important position in which mistakes would be costly and unpardonable. These two old men are endowed with a keen sense of humor and this has, no doubt, helped to carry them through the long years of continuous employment at hard, and sometimes dangerous, work. Andy is shy several fingers, but he has lost nothing of his sense of humor.

"Times Have Changed"

I met him one morning as I was passing through the shop. He laughed when he saw me coming and said, "Hays, times have changed in the boiler business; I have just thought of a funny experience that might interest you. It happened way way back in the horse-and-wagon days." Then he told me the story of the "Upside-Down Boiler."

Before getting into his story, however, I feel impelled to tell something of my engineering background. I never had any. When a youngster on the farm I tried to build a perpetual-motion machine. It didn't work. Some of the circumstances connected with that effort were so trying that I conceived a dislike for anything mechanical. It was in the late years of the "Gay Nineties" before I had my eyes fixed on *combustion*, from which they have never wavered. I am sorry for any young man when he is passing through the dis-

heartening process of finding himself.

I was born on a pioneer farm in Central Iowa. There were certain advantages in that, and they might have stood me well had I wanted to be a farmer. But I very definitely did *not* want to be a farmer—and just as definitely did *not* want to have anything to do with any kind of engineering.

I left the farm with no regrets, and went to college, where I took an old-fashioned "classical course." In addition to Latin, I read the Greek classics in the original. I studied French, Anglo-Saxon and Early English. Then I took a deep dive into English literature. There was some science in my course, and I took just as little of that as the course would permit. I was graduated with my eyes set on journalism and went at once to a newspaper job in northern Iowa. That was in 1890.

It would have been a very great advantage to me in the past forty years had I taken a real engineering course in a great university. But it is too late to cry about past mistakes, and I have no stomach for crying. I have, however, never really regretted that classical course. It seems to me that engineering students could, with advantage, absorb a little more of the strictly cultural college work, such as English, even if they had to take an extra year to do it.

A Country Editor

So I found myself on the job as a country editor. There were two job presses in the plant and an old Prouty news press. When in operation the Prouty thing reminded me of a grasshopper. It was driven by a small steam engine, and there was a small upright boiler. I never paid any attention to either of them. I knew nothing about scale, soot or any other of the pests that afflict steam boilers. It was the business of the office devil to fire the boiler and oil the engine and the presses. Why should I worry about such things?

I was the entire staff of the paper. I wrote every line that was set in type, except the advertisements. I solicited subscriptions and advertising, and did all of the accounting and collecting. I was responsible for the payroll, and that often worried me. I recall that the "Devil" used to tell me that the boiler needed cleaning—whether inside or out he did not explain.

But I don't think he ever cleaned it. There were times when the boiler would not make enough steam to run the Prouty. The Devil would then go out and get an old fellow we called "Bill." I can see him yet; he had a "walleye." Old Bill would glue his hands to the crank of the Prouty, bend his back and start in on the long grind to turn out about 1300 newspapers, chanting as he cranked and sweated,

"On this press day
The Devil's to pay."

That was an original composition of his own, and he said that the chanting made the work easier.

Having, as I hope, convinced the reader of my original total ignorance of, and even contempt for, all things engineering, I will now proceed with Andy Corcoran's story.

The Upside-Down Boiler

"It was away back, long before the days of automobiles and long-distance telephones. If you wanted to get anywhere through the country you had to walk, ride a horse or drive a wagon.

"The Company had a letter from a sawmill owner near Beardstown on the Illinois River. The letter said that his boiler was leaking and he wanted somebody to come over and fix it. He didn't say what kind of a boiler it was, where the leak was, or any other information. That was before the days of welding, so we knew it was a riveted 'high-pressure' boiler.

"We talked things over; 'If there are leaks around rivets maybe we can stop them by *corking* (sic) and that means we must take the tools for that work. Maybe we shall have to cut some rivets out and put in new ones. That means we must take rivets with us *and* a *forge*. If only that feller had given us some information. Also, maybe we'll find a lot of things he didn't know about.'

"We made a list of everything we could think of, including jacks, thread-cutting equipment, wrenches of all sizes, fittings of all sizes, pipe nipples and chewing tobacco.

"When we got loaded up we had a 2-horse wagon full of tools. It wouldn't do to get way down to Beardstown and find we were short a 2-in. coupling. We couldn't count on getting anything we might need in Beardstown in those days. And we knew there would be nothing at the plant. It was a sawmill.

"Forgotten Anything?"

"Finally we reported at the office and the Boss asked if we were real sure we had not forgotten anything. He said, 'Take plenty of everything. It would be a hell of a note to get way down there and find you couldn't do the job because you had forgotten something. Better take some log chains, ropes and tackles.' By George! The Boss had thought of something that we had forgotten. Then we thought of something else the Boss forgot. After we got on the job we thought of something all three of us had forgotten!

"When we finally loaded up the Boss called to us. He said, 'You know how slack things are in the shop right now. Before you come back, scout around. You might find some other boilers that need repairs. Maybe some boats tied up need repairs. Charge 'em plenty! And say, find out how the ducks are flying on the Illinois, and if the fish are biting. I may want to go down for a few days. Have a good time. Good-bye!'

"At last we got going. We had to go by our houses for grub pails and clothes. On the way there we decided to take along our shotguns and fishing tackle. We told our folks not to expect us until we came back.

"It was a long drive to Beardstown, about 65 miles as the roads went in those days. It took us over two days to get there with the heavy wagon. Luckily, it didn't rain. The sawmill man had an office in Beardstown. He looked surprised to see us and said, 'Why, I wrote you fellers not to come. I got the boiler fixed, and don't need you now.' We asked him how he fixed it and he said, 'Come along, I'll show you; and I'll bet you never saw a boiler leak stopped the way I stopped that one. Put up your team. We'll take my buggy.'

Chains on the Boiler

"We had to drive several miles up river to his mill. He took us inside and said, 'There she is, and she's not leaking a drop.' 'But,' we said, 'what on earth are those log chains doing around the boiler?' Then he explained that the boiler had a long crack at the top and that steam had been blowing out through the crack; he figured water was heavier and thicker than steam, and that a leak that would not hold steam ought to hold water; he had just turned the boiler upside down, and had a hell of a time doing it. Then he fired up, but the water came right out through the crack as fast as he could pump it into the boiler. That wouldn't do; the leak just had to be stopped.

"There were some thin water-soaked slabs in the river, so he took a couple of them and some log chains and drew the slabs up against the boiler and over the leak. That stopped all of the trouble. He was satisfied. He had piped up the steam outlet for a blowdown pipe and the blowdown for a steam outlet."

PRACTICAL AIDS TO OPERATION

Adds Ground Wire To 2-Wire Plugs

WE USE MANY portable and semi-portable machines in our plant. These connect to attachment plugs connected to ceiling outlets by about 2 ft of heavy flexible cord. Originally 2-wire flexible extension cords were used for machine connections with the machine frames ungrounded. A change in the state safety requirements made it necessary to ground the frames of all machines operated on extension cords.

To find a way to do this most economically and at the same time get a job that would meet state safety requirements and use a minimum of strategic material presented quite a problem. The first suggestion was to tape a ground wire to the outside of the original 2-wire cord. This would have met the safety requirements and would have been the lowest in cost of any of the schemes considered. It was abandoned, however, because tape on a flexible cord invariably came loose no matter how well it was applied, making an uncertain job.

We finally decided to replace the 2-wire extensions with 3-wire cords and use the original 2-wire flexible rubber-covered attachment plugs. This we did by boring a small hole in the rubber covering of each half of the plugs and bringing the ends of the ground wires out through these holes. We then connected the two power wires to the plugs as originally done. Then, a mechanically connected lug was put on the ground wires and the two on each plug connected with a short machine screw and nut, as in the photo.

Doing the job this way saved the rubber-covered attachment plugs, which would have been difficult to get because of priority restrictions, and also complied with all the safety requirements. Since the plugs are near the ceiling out of reach, the outside ground connection is better than one made in a three-pronged plug, because it can be made tight and can be readily inspected.

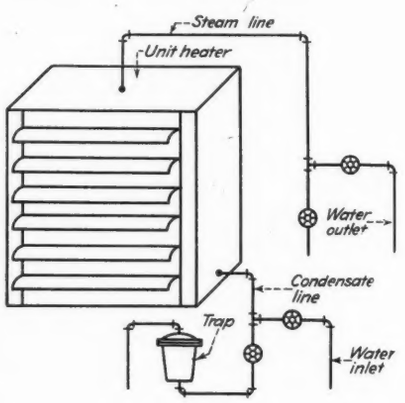
Englewood, N. J. R BOETTINGER

Unit Heater Cools Office in Summer

SOME OFFICES in industrial plants use small unit heaters, consisting of steam coils and an electric fan, for heating purposes. In the summer, these heaters may be easily converted to coolers by using cold water to lower the air temperature sufficiently to make the offices comfortable.

Only a few simple piping changes are necessary. The water-inlet connection is placed just ahead of the trap by inserting a tee in the outlet condensate line from the heater. A similar connection is made for the water outlet in the steam line as in the figure. Valves should be provided in each case to control the water flow.

A unit heater in one of our offices adapted for cooling air in the manner described, reduced the air temperature from 90 to 75 F with water at 55 F.



As heaters of this type are not properly designed for efficient cooling of air, water consumption is high in comparison to amount of air cooled. However, where water is neither scarce nor costly and comfort is of paramount importance, the unit heater adapted as a cooler will provide comfortable working conditions in a small office.

Staunton, Va. B G SWITZER

Improves Surface for Boiler-Tube Expander

SOMETIMES WHEN TOUCHING UP or rerolling an old boiler tube, trouble may be experienced with the expander jumping and loosening up because of scale in the tube. To prevent this diffi-

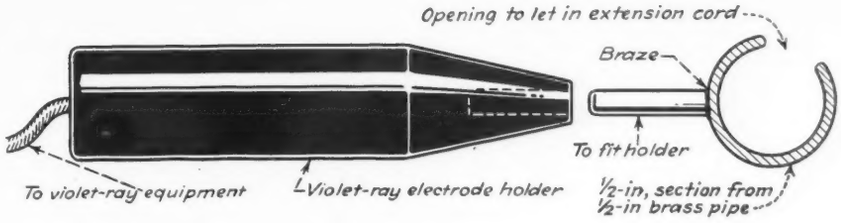
culty I put some oil on the rolls and mandrel and then sprinkle some fine sand in the oil. After making one or two revolutions in the tube with the expander it is removed. I then clean the expander and mandrel, wipe the oil, crushed sand and scale from the tube and proceed with the rolling as usual. The oil and sand cleans the tube for the width of the expander rolls and gives a good working surface. If sand is not readily available I use fine ashes.

Aurora, Col. E J DUFF

Violet-Ray Device Tests Extension-Cord Insulation

IT IS IMPORTANT in safety work to give careful attention to the condition of insulation on extension cords from portable hand tools and lights. These are often used in damp places where a poor spot in their insulation might pass sufficient current to give a workman a severe shock. They are also used on scaffolds, ladders and other hazardous places where only a slight shock or scare might cause a casualty.

Grounding of tool casings and lamp guards is important, but if the extension-cord insulation is not of a high quality throughout, a hazard still remains. Insulation of these cords may be of high quality when first used, but may be injured quickly by ordinary use about the plant. Therefore it is necessary to be able to check the insulation on these cords conveniently.



To do this I use a violet-ray device modified to meet the conditions. To the end of a metal rod, of a diameter to fit the violet-ray electrode holder, I brazed a ring made from a ½-in. section of ½-in. brass pipe. A slot is cut in the side of the ring as shown, through which an extension cord can pass.

The cable is put into the ring and the violet-ray device energized. If the insulation is in good condition there will be a light static discharge between the ring and the insulation as the ring is moved along its surface. At spots where the insulation is poor or where broken wire strands have worked up near the surface of the insulation, static sparks will occur between the ring and insulation, indicating the location of an insulation defect.

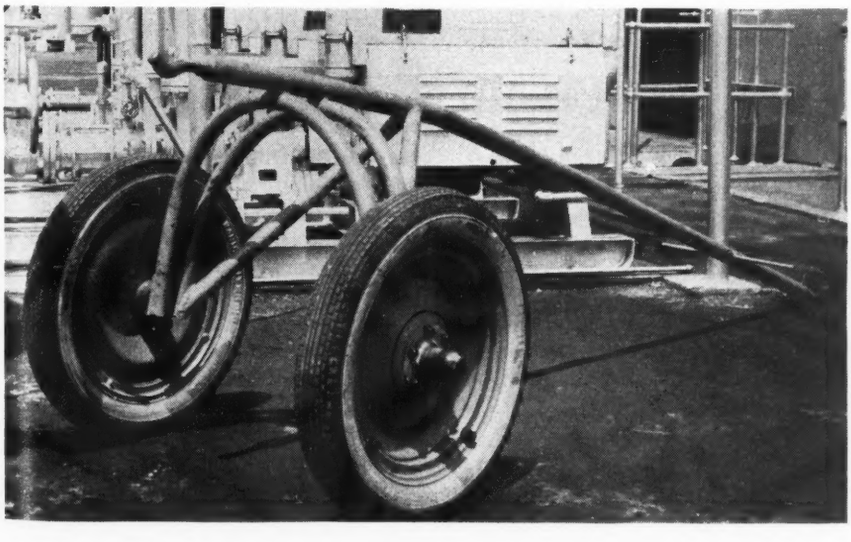
Watseka, Ill. T W LAWSON
Plant Engineer
Western Condenser Co

Buggy Serves As Repairman's Helper

COMPRESSOR CYLINDERS, pistons and makeup pipe manifolds too heavy for one man to handle alone are frequently moved around a power station or engine room. Since the war program has taken many of the available men from industrial plants a repairman responsible for the maintenance of a large gas-compressor station devised and built a 2-wheeled buggy, shown in the photo, as his helper. Taking the front spindles and wheels of a wrecked Chevrolet automobile as the rolling stock, he built a double arch of extra heavy 2-in. tubing reinforced with an inverted V made of 2-in. pipe, joined together at the top by a long length of pipe as a handle of the buggy.

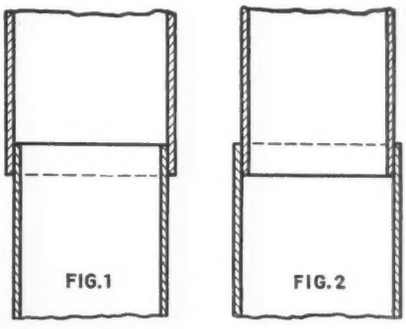
He welded the flanges of the wheel spindles to the ends of the double arch while holding the wheels parallel to each other. A solid-iron shallow hook inserted in the opening of the short end of the pipe tongue carries the load. Raising the tongue when the lifting chain is attached to the hook results in a short hitch. When the tongue is lowered to the floor or ground, a second chain attaches to the other end of the load for binding around the tongue. Leveling the tongue after the load is chained lifts both ends of the load from the ground so that the buggy can be easily moved to any part of the plant by one man.

Santa Monica, Calif. J C ALBRIGHT



Wrong Laps and Corrosion Ruin Steel Stack

AFTER EIGHT YEARS of operation, a steel stack on our mill was rusted at every seam for 30 ft up. This stack was constructed (Fig. 1) so the inside joints formed pockets at the top of the joints. Moisture forming inside the stack would run down and seep out at every joint, causing rusting.



When I put up the new stack I reversed ends, as shown in Fig. 2, eliminating the inside pockets. Now the moisture or sweat is evaporated by the heat as it runs down.

The boiler inspector has been watching the results on the new stack, which has now been up four years with no sign

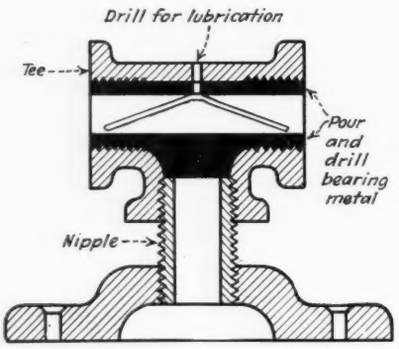
of deterioration. Our mill is located up in the hills where it gets quite cool at night. I have seen water stream down the side of the stack and run out of every joint when the fire was banked.

I would like to know whether other engineers have had similar experience.

Naples, Idaho DICK SNIDER

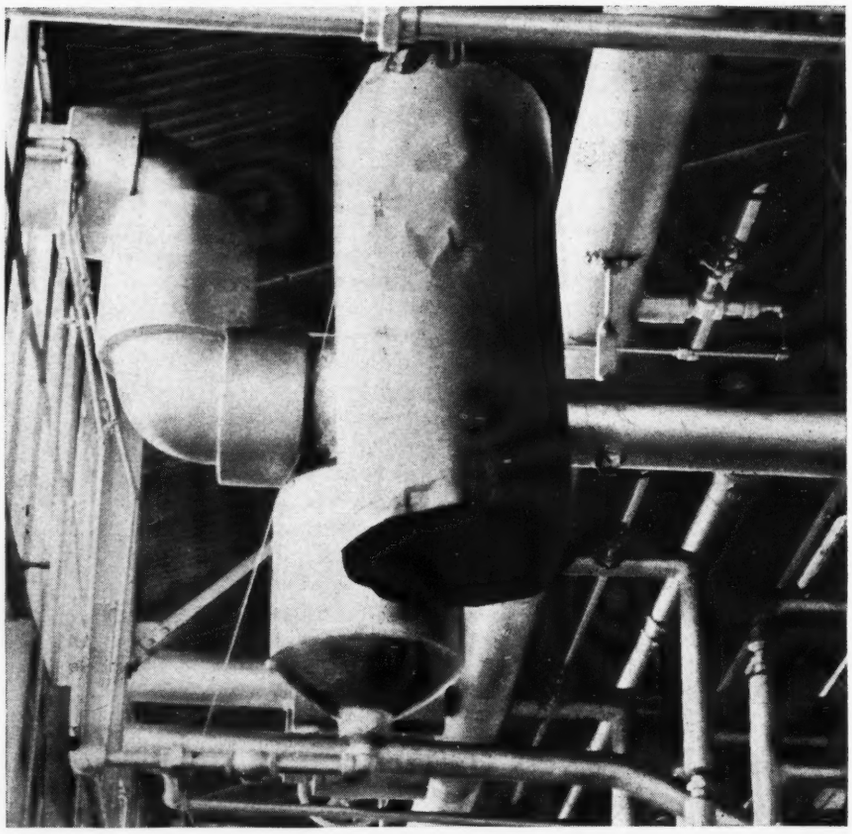
Bearings From Pipe Fittings

MUCH IS BEING SAID these days about bearings, so I would like to add my contribution. I recently needed a bearing to support the end of a shaft in an experimental machine and made it from the materials shown in the diagram. The bearing is a pipe tee of the proper inside diameter to hold the babbitt, which, after being poured, was bored out in a lathe to the shaft diameter. A lubrication hole was bored in the top of the bearing and groove cut from it to distribute the lubricant. We made a support for the bearing from a pipe nipple and flange. Even though this may be a special case, a sleeve bearing can be made easily from a pipe coupling, babbitted to a proper thickness, bored out to fit the shaft and the outside of the coupling turned to size for the bearing housing.



Graterford, Pa.

JOSEPH M KURLIAN



Easily Made Hood Controls Illumination

IN POWER STATIONS and buildings where it may be necessary to reduce illumination intensity in emergencies without pulling the switch, a blackout hood shown in the photo can be made cheaply by any mechanic. For the body of the hood, shape a sheet of heavy craft or tough black building paper into a cylinder large enough to pass freely over the lamp reflector. Stiffen the lower end of the cylinder by weaving steel wire in and out around its circumference.

After placing the cylinder around the reflector, crimp its top end inward to reduce its diameter and stiffen by weaving steel wire through the crimps and add a lifting bail. A cord attached to the bail and run through a small pulley directly above the lamp and to a hook shoulder high above the floor raises and lowers the hood to control the illumination. Raising the hood so that its lower end is up on the reflector gives full illumination for normal operation. In emergencies the cord releases the hood and it lowers until its crimped top rests on the lamp reflector to shroud the light so that practically none of it passes through the windows. The illumination, however, is sufficient for employees to move about freely without danger of injury.

Santa Monica, Calif. J C ALBRIGHT

Brush Connections Source of Trouble

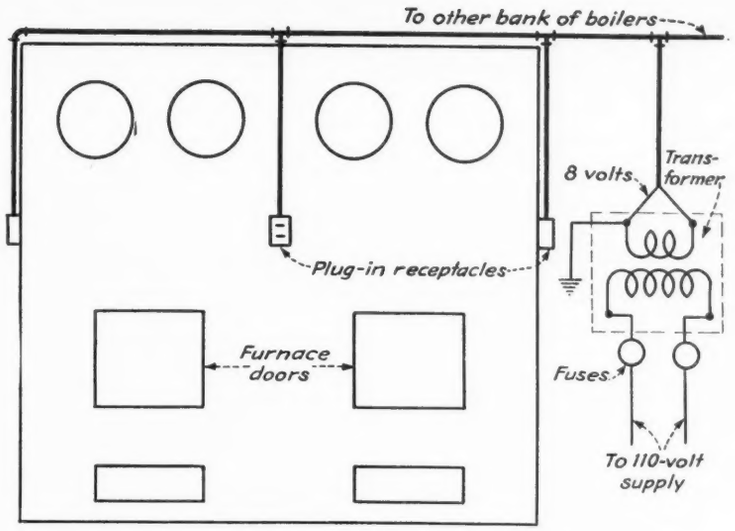
GOOD SHUNT CONNECTIONS between the brushes on commutators and slip rings are important if trouble is to be avoided. If these connections are not made properly, current will flow from the surface of the brushes into the brushholders and cause burning of both. I have found brushes partly burned through from this cause and the brushholders seriously damaged.

When the shunts are not in good condition the resistance of the connections between the brushes and brushholders will vary over a wide range and cause unequal distribution of the total load current between brushes. This may cause sparking at the brushes and burning of the commutator.

In one case of commutator trouble that I was called to investigate, the engineer in charge had checked about everything but the brush shunts. These I found in bad condition and making poor connections between the brushes and their holders, which were so hot that the temper had been drawn from the tension springs on the brushes.

After the commutator and brushes had been cleaned up and the spring tension adjusted on the brushes, in a short time the springs would bend and reduce the tension on the brushes. The brushes were not held firmly to the commutator surface and they started sparking, which helped to aggravate the already bad conditions and it was not long before the brushes and commutator were badly burned.

When new brushholders and brushes with proper shunts were installed the



Low-Voltage Lamps for Boiler Inspection

WHEN OPERATORS ARE WORKING in and around boilers a strong, safe and convenient light is essential to good work, thorough inspection and personal safety. Listing the faults and advantages of the commonly used lights, we have the pocket flashlight which is safe from the electric-shock standpoint, but even with new cells gives only a small amount of light. The carbide lamp commonly used by boiler inspectors is also free from electric-shock possibilities, but has to be recharged every few hours, and its flint may get wet, making lighting difficult. A 110-volt lamp on an extension cord gives plently of light but forms a serious electric-shock hazard and should be avoided.

With this thinking as a background we installed and put into operation a low-voltage lighting system for our boilers that has all the good qualities of the commonly used systems but none of their faults. The heart of this system is a 150-watt, 110/8-volt transformer. In our plant there are two banks of two boilers each so that the transformer was located between them to keep circuit length to a minimum.

Four plug-in receptacles were provided on each bank of boilers: one at the back of each bank for cleaning and inspecting drums; one between the boiler fronts, about 5 ft from the floor, for inspection of fire boxes and tubes; and one on each side of the bank about 5 ft from the floor for use through side inspection doors. All wiring was done with No. 14, 2-wire BX. To eliminate the danger of 110 volts getting on the 8-volt circuit we grounded the transformer core and one side of the 10-volt circuit.

For a light we use an automobile spot lamp with a clear lens, which we obtained for less than $1.00. To make a handle for the lamp we wrapped its mounting bracket with friction tape and also taped the outer edge of the lens holder to protect it against bumps. A 32-candlepower lamp was used with both filament terminals coming to separate connections in the lamp base to insulate the electric circuit from the lens holder. This equipment is low in first cost, safe, reliable and provides plenty of light where needed.

Peabody, Mass. OLIVER RANTANEN

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brush and commutator trouble disappeared. When you have brush and commutator trouble make sure that the connections between brushes and their holders are ample.

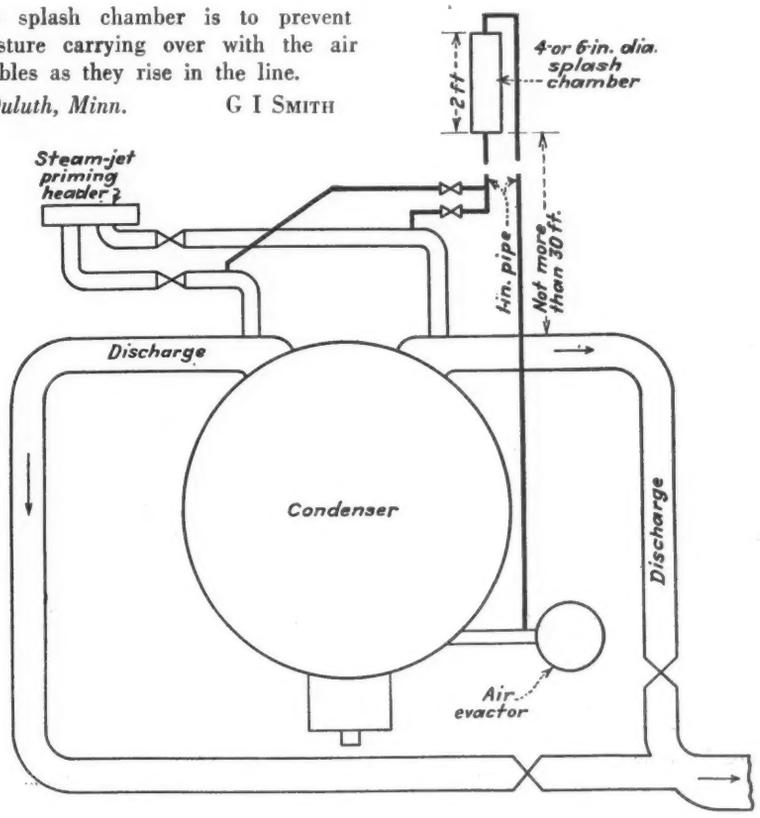
Detroit, Mich. L R CARY

Air Evactor Holds Condenser Prime

SURFACE CONDENSERS that are installed higher than their cooling-water discharge pond, with their discharge sealed so that there is a negative pressure on the water box, occasionally lose prime because air and gas are pocketed, lowering the water level in the condenser. It is then necessary to use the priming jets to restore the effectiveness of the condenser.

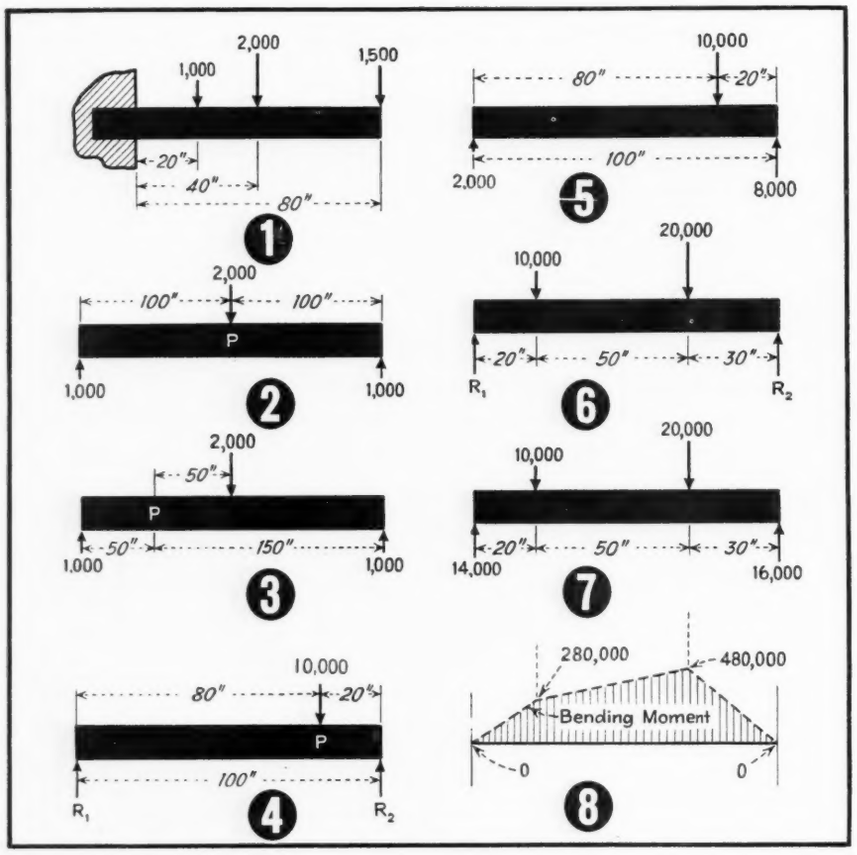
This air and gas can be removed continuously by means of a connection to the condenser air evactor through a loop high enough to prevent the raw cooling water from being drawn over into the condensate stream, as done in one plant and shown in the diagram. The splash chamber is to prevent moisture carrying over with the air bubbles as they rise in the line.

Duluth, Minn. G I SMITH



How to Figure Beams—No. 5

BY PHIL SWAIN



THE PRACTICE PROBLEMS in installments 3 and 4 were confined to beams loaded uniformly or with a single concentrated load. The problems here will cover beams with loads off center and with more than one load. In each case the problem will be to find where the bending moment is greatest and what the moment amounts to at that point.

Easiest to figure is the cantilever (Fig. 1) with several concentrated loads. With a cantilever the greatest moment always occurs at the support (wall), and is the sum of the moments of the loads. Thus: Maximum moment = moment at wall = 1000 × 20 + 2000 × 40 + 1500 × 80 = 20,000 + 80,000 + 120,000 = 220,000 lb in. Since this is the greatest bending moment anywhere in the beam it must be used in selecting the proper beam section by the methods explained in previous installments.

Fig. 2 is a 200-in. simple beam with a 2000-lb load at center. Clearly the upthrust of each support will be 1000 lb. In a simple beam with concentrated loads, the greatest bending moment always appears under one of the loads. If there is only one load it must be under that one. Considering section *P*, the 1000-lb reaction of the left support attempts to turn it *clockwise* with a lever arm of 100 in. or a moment of 1000 × 100 = 100,000 lb in. At the right the support's reaction of 1000 lb is trying to turn section *P counterclockwise* with a moment of 1000 × 100 = 100,000 pound inches. The two balance; that's why the beam does not move. So to get the moment at *P* consider all the forces at the right or all at the left, but not on both sides.

For example, take point *P* in Fig. 3. Using forces at left, the moment is 1000 × 50 = 50,000 lb in. If we take the forces at the right we will get the same answer: The 1000-lb reaction at the right has a *counterclockwise* moment of 1000 × 150 = 150,000 lb in. The *clockwise* moment of the 2000-lb load partly cancels this: 2000×50=100,000 lb in.

To figure the beam with a single *off-center* load (Fig. 4), first figure the reactions R_1 and R_2, working on the principle that the bending moment at R_1 is zero. That means that all the *clockwise* moments at the right of R_1 equal the sum of all the *counterclockwise* moments at the right. Therefore. $100 \times R_2 = 80 \times 10{,}000$; $100\ R_2 = 800{,}000$; $R_2 = 800{,}000 \div 100$; $R_2 = 8000$ lb. Because the right support carries 8000 lb of the total 10,000-lb load, the left support must carry the remaining 2000 pounds, as shown in Fig. 5.

The maximum bending moment must come in section *P* directly under the load. Its value can be figured as 80 × 2000 or as 20 × 8000, in either case 160,000 lb in.

Next take a simple beam with two concentrated loads (Fig. 6). First figure the reactions from the principle that the sum of the clockwise moments to the right of R_1 equals the sum of the counterclockwise moments to the right. Then $100\ R_2 = 20 \times 10{,}000 + 70 \times 20{,}000$; $100\ R_2 = 1{,}600{,}000$; $R_2 = 16{,}000$ lb. Then R_1 must be 14,000 lb, because the two supports together carry 30,000 lb.

Now, turning to Fig. 7, figure the bending moment under the two loads. The greater of the two will be the greatest in the beam and the one to be used to select the proper beam section.

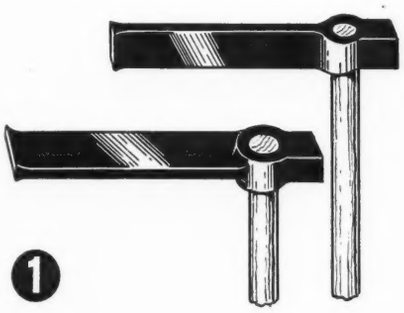
At each point you can figure the moment at the right or at the left, whichever is more convenient. Using the left-side moments at the 10,000-lb load, we get 14,000 × 20 = 280,000 lb in. The moment under 20,000 lb (using the right-side moments) is 16,000 × 30 = 480,000 lb in.—the one to use.

Engineers frequently plot bending-moment diagrams, as shown in Fig. 8 for the beam of Fig. 7. Moments are known to be zero at the supports, and are as indicated at the loads. Where the loads are concentrated the moment diagram is always made up of straight lines from one known point to the next, so we get a diagram giving the bending moment to scale at every point in the beam from one end to the other.

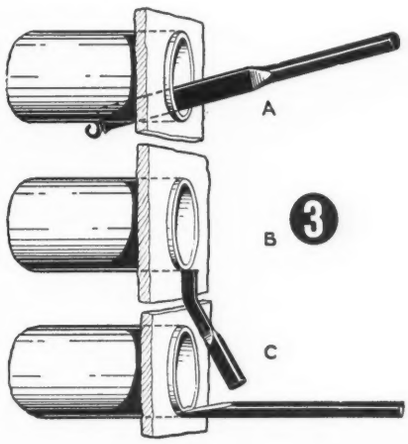
HOW TO REMOVE BOILER TUBES

REMOVING BOILER TUBES can be easy or difficult, depending on the tools available for doing the job. Gas-burning equipment speeds up the work but cannot be used under all conditions and is not always available in small plants. Mechanical cutters produce a slight flare of the cut ends which is troublesome where tubes must be removed through the tube hole.

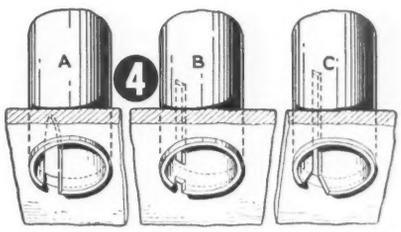
Even though gas torches and mechanical cutters are available, restricted areas make it necessary sometimes to use hand cutting. A clean-cut end, which allows the tube to slide through the tube hole, can be made more easily with hand tools. An exception is the complete retubing job, where torches and mechanical cutters operate at their best. E J Duff explains use of hand cutting on low-pressure boilers.



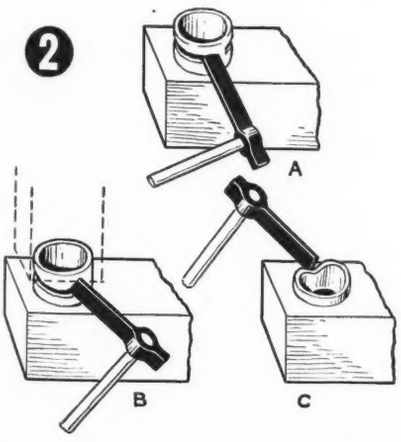
1 Sledge ripper, a 2-man tool, reduces cutting time on large tubes, and is also easier to use in obstructed corners than a one-man tool. Provide two of these rippers, one with cutting edge parallel to the handle and the other with its blade at right angles. The upset cutting edge eliminates binding and allows free blade travel



with the top edge of the ripping tool; any small remaining ridge can be removed with a flat file. Use bent tool, *B*, to raise the tube from its seat before ripping as a precaution against gouging the seat. Oyster knife, *C*, is used to constrict the tube end and loosen it from its seat. The knife consists of a round piece of cold-rolled steel, ground or cut on one side to a 4-in. flat taper running to a point on the end. Do not temper the knife. Use care to prevent gouging the tube seat when driving under a tube

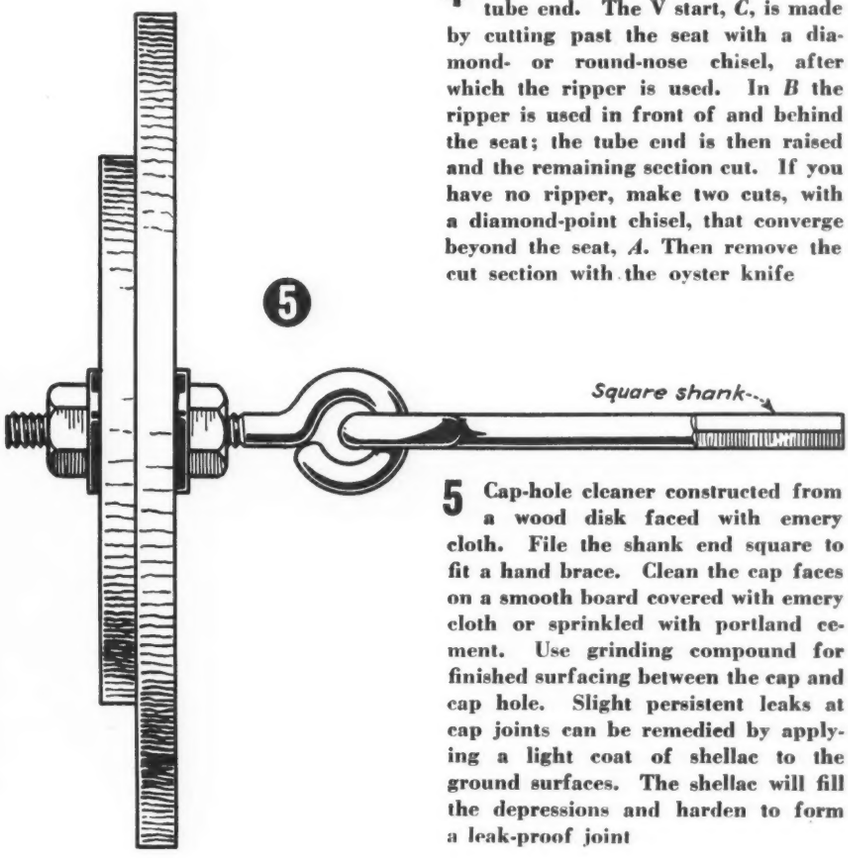


4 Three good methods of slitting a tube end. The V start, *C*, is made by cutting past the seat with a diamond- or round-nose chisel, after which the ripper is used. In *B* the ripper is used in front of and behind the seat; the tube end is then raised and the remaining section cut. If you have no ripper, make two cuts, with a diamond-point chisel, that converge beyond the seat, *A*. Then remove the cut section with the oyster knife



2 Use sledge ripper to remove mud-drum nipples. First, *A*, cut the nipple in half, then, *B* drive the upper part in and upward so it can be removed from the header cap hole. *C*, remove lower half by driving it in and down into the mud drum

3 Straight hand ripper for splitting tube ends. This method produces metal curl, *A*, which must be removed before the tube will slide through tube hole. Remove the curl by shearing



5 Cap-hole cleaner constructed from a wood disk faced with emery cloth. File the shank end square to fit a hand brace. Clean the cap faces on a smooth board covered with emery cloth or sprinkled with portland cement. Use grinding compound for finished surfacing between the cap and cap hole. Slight persistent leaks at cap joints can be remedied by applying a light coat of shellac to the ground surfaces. The shellac will fill the depressions and harden to form a leak-proof joint

READERS' PROBLEMS

Questions from Our Readers

What Causes Burn Spots?

Question 1

THE COMMUTATOR *on a 25-hp 6-pole 70-rpm dc shunt-wound elevator motor contains six equally distributed burn spots corresponding to the brush spacing. Each burn covers an area of four commutator bars and begins to appear a few days after resurfacing the commutator.*

This trouble has been continuous since a few coils were replaced several years ago. Feeling that the cause might lay in these coils I checked them repeatedly without finding any trouble.

When the elevator ascends no sparking appears, but slight sparking occurs when it lowers. Slightly greater sparking occurs during starting and stopping. There are several of these machines in service and, although sparking on the others is more severe, this is the only motor that shows definite spaced burns on the commutator. What can be causing this trouble when it does not appear on the other motors?—ENC

Need More Air

Question 2

WE HAVE SIX SINGLE-CYLINDER *double-acting single-stage water-cooled 12 x 11-in. 325-cu ft 230-rmp air compressors, each driven by a 60-hp motor. These units are connected to a common header and receivers.*

Plant changes now being made will require more air than we can now produce. Can the capacity of these units be increased by connecting a centrifugal or displacement blower to act as a booster at the intake? If this method is not practical, what can we do to increase their capacity?—KN

Ammonia Brine-Cooler Tubes

Answers to Sept Question 1

The Question

WE MUST RETUBE OUR AMMONIA BRINE *cooler with charcoal-iron tubes, as steel ones are not available. After receiving several recommendations on this material we have decided to go ahead with the retubing. However, I am still concerned about what effect the ammonia will have on these tubes and whether they will stand up as well as those made from steel.*

We use calcium-chloride brine. Ammonia suction pressure is 10-30 psi, and the brine temperature varies from 0 to 10 F. The cooler has 80 tubes 2 in. in diameter by 16 ft long.—PCJ

Ammonia Will Not Affect Charcoal Iron

CHARCOAL IRON, a variety of wrought iron, derives its name from the fuel used in the puddling process. Wrought iron pipe has been used for years in the coal gas industry, where it is exposed to ammonia vapors and liquor of different degrees of saturation.

From my experience with the residue of lime used as a catalyst in the extraction of ammonia from ammoniacal liquor. I would say that ammonia would not make any impression on the slag film, composed of the residue of limestone carbon and iron impurities entrained in the puddling process, of the charcoal-iron tubes.

I believe the charcoal-iron tubes will stand up better than the harder steel tubes, because of the low ammonia suction pressure.

Kitchener, Ontario WILLIAM VICKERS

Maintain Brine pH at Correct Value

UNLESS PCJ'S AMMONIA contains considerable water, indicated if the expansion valve sometimes freezes when it is throttled closely, the iron tubes will be safe from attack on the refrigerant side. He should test his ammonia for water by drawing off a gallon or so into a suitable loosely covered container and allowing it to evaporate. Gas issuing from under the cover will keep moisture of the air from being absorbed by the liquid. Some moisture may be carried out with the gas so that if a small quantity of water remains in the container after the refrigerant evaporates, he should bottle the ammonia and ship it to the manufacturer for cleaning.

PCJ does not state why his original steel tubes failed. From my experience with brine-ammonia transfer systems, I believe they failed at the ends exposed to the brine. Unless particles of rust are being circulated from the piping system, the tube flare is attacked first. Corrosion does not start in neutral or alkaline brine, but once started in acid brine will propagate itself even when the brine is rendered alkaline to a pH of 9.0 or above. I suggest that PCJ get a pH testing set for calcium-chloride brine, and maintain the pH value at 9.0 or slightly higher, unless he has galvanized cans or piping to protect. The pH can be raised by adding lime or other mild alkali, or lowered with dry ice or bottled CO_2.

Menard, Ill. GEORGE HOLMAN

Don't Allow Leaks to Develop

PCJ SHOULDN'T EXPERIENCE any difficulty while using charcoal-iron tubes in his ammonia brine cooler. Pipe interiors handling either sodium or calcium chloride will not vary much in their condition when inspected; however, if leaks develop, the ones leaking sodium chloride will have greater corrosion and deterioration than those leaking calcium chloride. This is because calcium chloride will hold its moisture, causing the pipes to remain moist longer. Calcium chloride also contains fewer impurities than sodium chloride.

I can't see any reason why he should worry about using charcoal-iron tubes, as long as he maintains the proper solution of calcium-chloride brine.

Fairview, N. J. M N GOZDENOVICH

Wrought-Iron Tubes Gave Good Service

THE FOLLOWING COMMENTS may be of interest regarding the use of charcoal-iron tubes in ammonia brine coolers.

In 1911 an oil refinery in Tampico, Mexico, installed a complete 50-ton absorption plant for the manufacture of paraffine wax. Included in this project was a 42-in. x 10-ft brine cooler containing 118-2½-in. No. 12 wrought-iron tubes. This plant has been operating continuously except for periodical shut downs. The tubes were entirely replaced in 1936 after 25 years service.

This plant circulates 168 gpm of

(*Continued on page* 124)

Right off the *Top*, boys *and plenty Dirty!*

Getting stores from the top of the heap is always a dirty job . . . for dust settles on horizontal surfaces everywhere whether these surfaces are boxes in storage or parts inside motor control in any factory.

Cutler-Hammer *Vertical* Contacts are the mark of better Motor Control, another extra dividend on Cutler-Hammer's unequalled specialized experience and decades of leadership.

More and more engineers *are* recognizing the hazard of dust in Motor Control. That fact is proven by another fact . . . that more and more engineers responsible for non-stop victory production are *insisting* on Cutler-Hammer Motor Control. It's the Motor Control with the famous *dust safe* VERTICAL contacts that can't collect dust, that *stay* clean to last longer and work better. Dirty electrical contacts can sabotage production just as surely as any "underground" organization, and a great deal more insidiously. Play safe. Specify Cutler-Hammer Motor Control and *see the difference*. CUTLER-HAMMER, Inc., 1358 St. Paul Avenue, Milwaukee, Wisconsin. *Associate*: Canadian Cutler-Hammer, Ltd., Toronto.

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CUTLER-HAMMER
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Dust Safe
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Contacts

1892-1942 **50th ANNIVERSARY**

25% calcium-chloride brine at 20 psi pressure. Considerable quantities of rust accumulated in the brine tanks and it was necessary to clean the system and replace the brine after a few years. A year ago, in order to reduce this corrosion, the brine was neutralized by adding 100 lb of sodium dichromate and 27 lb of caustic soda per 1000 cu ft of brine solution. When the brine was tested after a year's service it was found to be quite clear with little suspended iron rust.

Inasmuch as charcoal iron is considered one of the purest grades of wrought iron, and in view of our experience with the use of wrought-iron tubes, I doubt if PCJ will have any more trouble with the substitution than he did with the steel tubes he formerly used.

Tampico, Mexico F D Smith

No Cause for Alarm

If PCJ is concerned with the possibility that ammonia corrodes charcoal-iron tubes more readily than it attacks similar tubes made of steel, he can rest assured that such is not the case.

Briefly, tests on iron in various forms including wrought and charcoal iron, steel, pipe steel and puddled iron when exposed for long periods of time to the action of water, both sea and distilled, aerated brine, ammonia and the weather, showed on the average that steel lost about 97% as much weight by corrosion as did wrought or puddled iron, and approximately 96% as much weight as charcoal iron. While there appears to be some advantage in favor of steel from a corrosion-resisting viewpoint, the difference is not great enough to worry about.

Mt Vernon, N. Y. Brian Corrigan

Use Wrought Iron

Corrosion is one of the most serious problems confronting operators of any refrigerating system. Recognition of this fact, coupled with action for reducing its effects, will result in considerable savings in maintenance and replacements. Two methods for prolonging the service life of those parts exposed to the calcium brine and ammonia are, (1) use corrosion-resisting material and (2) modify the corrosive conditions so that corrosion-resisting material will give the most in economical service life.

The installation of charcoal-iron tubes will prove as good as the steel tubes. The corrosive conditions encountered by tubes in ammonia brine coolers are by no means easy on the tube material. Brines, either calcium or sodium chloride, are excellent electrolytes and combined with oxygen or any acid-forming compounds, their corrosive action on most metals is rapid. Therefore the proper pH value must be carried at all times.

I would recommend that PCJ give consideration to installing genuine wrought-iron tubes in this brine cooler, as for this service it is considered superior to charcoal iron. This is substantiated by experience, and long service records are not unusual. The writer has in mind a brewery installation in which the ammonia brine-cooler tubes were replaced after 40 years of service.

Cleveland, Ohio A R Ciotti

Use Sodium Dichromate And Caustic Soda

No deterioration need be expected on the ammonia side of the charcoal-iron tubes in PCJ's brine cooler. Corrosion on the brine side can be eliminated by maintaining a chromate content sufficient to impart a distinct yellow color to the brine. Then for every thousand cu ft of brine add a solution of 10 lb sodium dichromate crystals in water followed by 2.75 lb of caustic soda.

This will provide the chromate desired without appreciably affecting the alkalinity of the brine. Maintain a pH value of 7.5 to 8.0 if there are galvanized surfaces in the system. If the system is all bare iron then higher pH values are permissible. The pH value may be increased by adding a higher proportion of caustic soda than the dosage suggested above. To reduce the pH value add the sodium dichromate with a smaller proportion of caustic, or none at all.

An occasional laboratory test of the brine is advisable to check gravity, pH value, and chromate content. In the absence of any testing facilities, add the dosage specified and then repeat the treatment when the yellow color begins to fade.

Extremely high chromate contents are not desirable in systems with ice-freezing tanks where the brine comes into contact with the workers' hands and clothing. In such cases a worker may become affected with chrome itch.

St. Louis, Mo. K M Holaday

Keep Air Out of the Brine

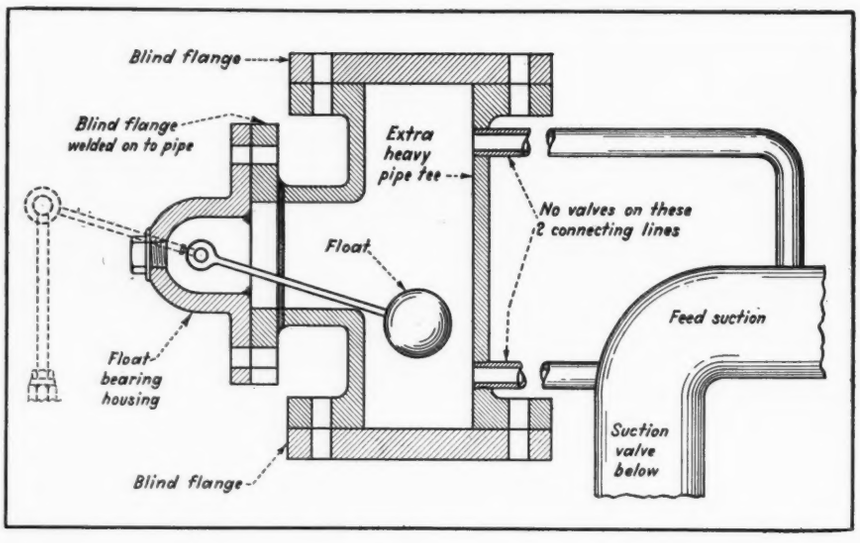
PCJ should have no trouble with charcoal-iron tubes in his brine cooler, as both steel and iron have been used with little or no variation in corrosion. The durability of the metal depends on the condition of the brine, and as he uses calcium chloride, no trouble should be experienced from corrosion, as this brine is the least corrosive.

In marine practice it is customary to add 1 lb of caustic soda for every 100 lb of calcium chloride, this of course varies with the condition of the tubes.

Air should be eliminated from the brine system entirely, and the coils should be kept covered to prevent excessive corrosion which would be caused by air entrapped in the brine system.

Grand Rapids, Mich. J M Gorrie

(*Continued on page* 126)



YARWAY IMPULSE TRAPS SPEED THE NEWS

12 Yarway Traps Drain Drying Cylinders on Giant Gravure Machine

IN Louisville, Ky., that Rotogravure Supplement that brings you the News in Pictures, is hurried on its way by Yarway Impulse Steam Traps.

Twelve Yarways drain the steam-heated cylinders that dry the printing ink at the Standard Gravure Corporation, subsidiary of the Courier-Journal and Louisville Times.

Always on the job, ready to handle the heavy condensate load when starting up, these traps get the cylinders hotter, sooner, and give greater sustained heating efficiency during the run.

They also are liked for their small size that saves space and their light weight that needs no support.

Have you investigated this trap that costs no more to buy than it usually costs to repair other type traps?

More than 90 thousand are already in use and orders today are at an all time high—as satisfied users call for more and more.

Ask for Bulletin T-1737 or see your local mill supply dealer.

YARNALL-WARING COMPANY
100 Mermaid Ave. Philadelphia

YARWAY IMPULSE STEAM TRAP

Prevent Brine Acidity

PCJ SHOULD NOT HESITATE about using charcoal-iron tubes with ammonia and calcium-chloride brine. However, to prolong the life of the tubes, he should control and maintain the proper pH value of the brine. Calcium-chloride brine should never be in an acid condition, because tubes, cans, and pipes will corrode rapidly. Of course, electrolytic action also causes deterioration. This can be minimized by eliminating unlike metals which will set up electric currents when in contact with the brine, and corrode tubes and plates with comparative rapidity.

Schenectady, N. Y. CARL BACHMANN

High-Pressure-Pump Trouble

Answers to Sept Question 2

The Question

SOME TIME AGO *one of our steam-turbine-driven boiler-feed pumps was damaged when we started it with the suction valve closed. Suction pressure is 250 psi and the pumps operate at 950 psi for boiler-feed supply. Although equipped with the usual governor and overspeed device, which operated on the trouble mentioned above, the pump was damaged before it could be stopped. How can we protect our pumps against this trouble yet have assurance that shutdown would not occur on a slight drop in suction pressure?*—GLK.

Install Pump Bypass Line

GLK's TROUBLE may be traced to one of two reasons. If it is a high-pressure multistage volute pump without a balancing disk the trouble may be caused by the unit running dry. The pump is designed to develop 700 psi at constant speed, and with a suction pressure of 250 psi the total pump discharge is 950 psi. However, with the suction valve closed, the pressure regulator would not control the pump speed until a predetermined pressure is exceeded.

The time interval required for the pump overspeed governor to function might raise the water temperature to the point of vaporization. One answer to this situation involves providing a bypass arrangement to circulate a small quantity of water through a cooler back to the pump suction. The bypass discharge pressure can be reduced by fitting the bypass with an orifice plate.

The bypass should be located ahead of the discharge check valve so the pump can circulate water to prevent flashing. The bypass should be of sufficient capacity to provide 25 gpm for every 100 bhp at shutoff. If the pump is equipped with a balancing disk or drum, the cause of the trouble may be at that point.

The balancing chamber connects either to the pump suction or to the deaerating heater and the backpressure in this chamber is but slightly higher than the suction pressure.

The water may pick up sufficient heat so that the vapor pressure of the water at the exit of the disk is greater than the pressure existing in the relief chamber. Flashing will occur and the close-clearance joints of the balancing drum or disk will seize. The best remedy for this would be to locate a throttling orifice in the line leading from the relief chamber to the pump suction. This will build up a high backpressure in the relief chamber to prevent flashing.

It seems that the trouble appears also when the suction pressure drops, causing the pump to speed up to develop sufficient discharge pressure. The bypass would allow the pump sufficient liquid to prevent it from running dry and seizing.

In a recent installation in which the pumping unit was blamed for a great deal of the trouble, investigation proved that the trouble was not in the pump but in the heater from which the pump was taking its suction. It was discovered that the pressure of the steam entering the heater fluctuated and a sudden decrease in pressure caused vaporization of the water in the pump suction line.

East Orange, N. J. R C MCDONALD

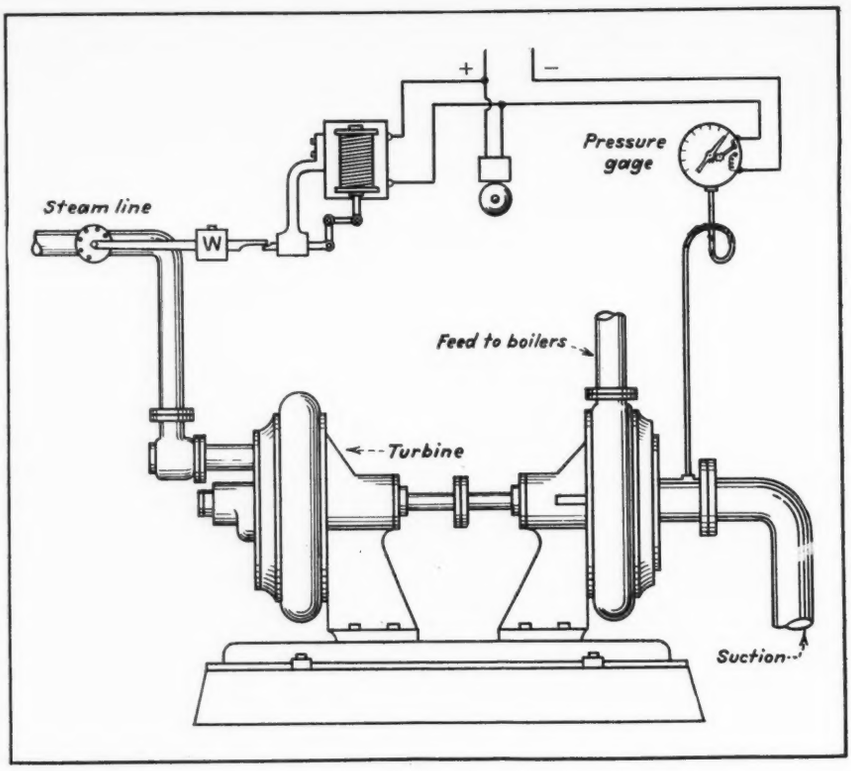
Low-Pressure Trip On Steam Valve

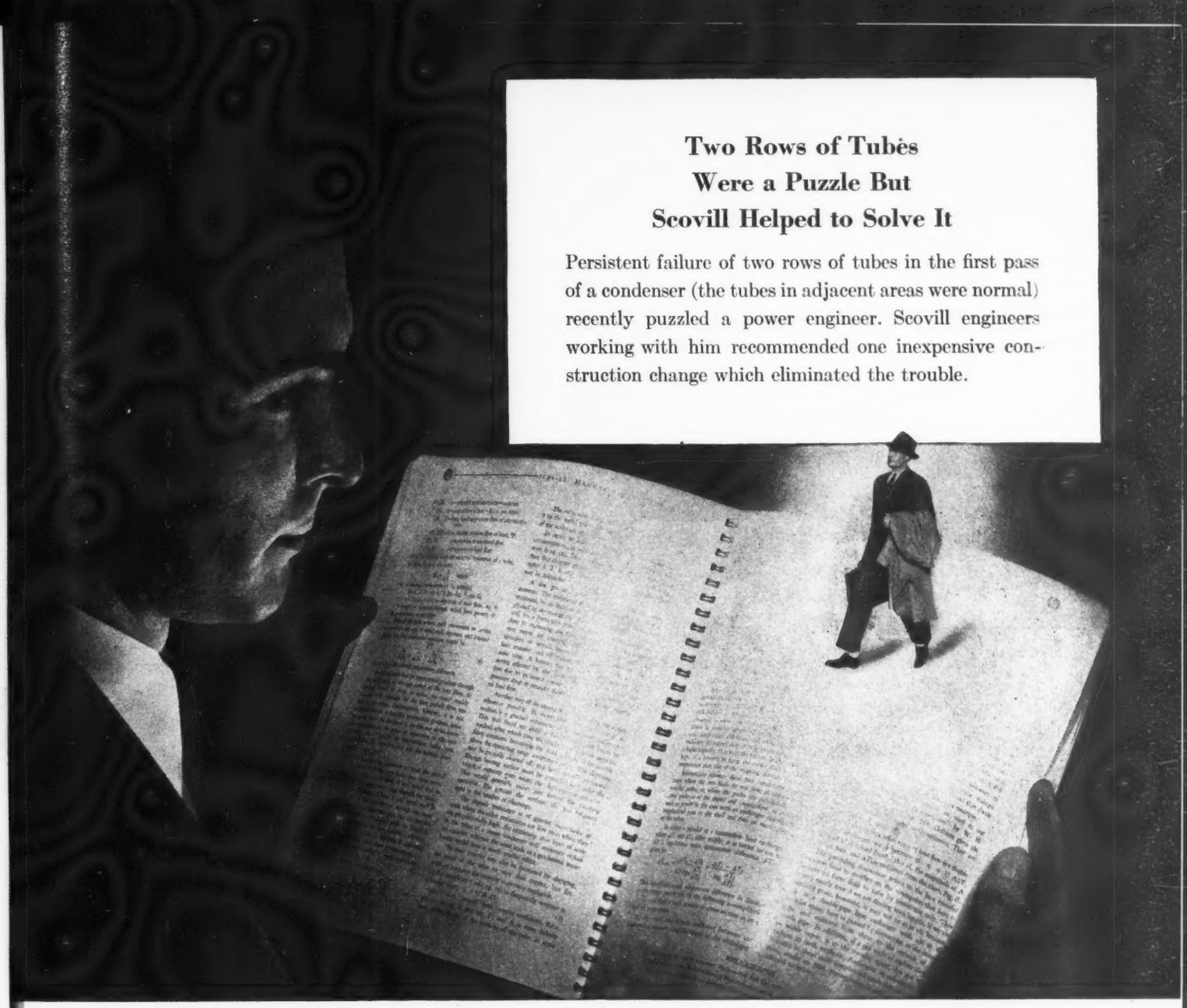
FROM THE INFORMATION GIVEN by GLK it is not a vapor-bound pump condition, but a definite lack of water caused by the closed suction valve, against which he wishes to protect the pump.

I would suggest installing a quick-closing valve in the turbine steam line operated by a weighted handle and held open by a dog on an electrical tripping device. This trip to be controlled by a pressure gage connected in the pump suction and fitted with an electrical contact, working off a quadrant gear on the dial shaft. This contact can be set to close at any predetermined drop in pressure below normal suction pressure (sketch below).

The terminals of the gage connect to the electrical tripping device in the

(*Continued on page* 128)





Two Rows of Tubes Were a Puzzle But Scovill Helped to Solve It

Persistent failure of two rows of tubes in the first pass of a condenser (the tubes in adjacent areas were normal) recently puzzled a power engineer. Scovill engineers working with him recommended one inexpensive construction change which eliminated the trouble.

Call on the man between the lines

To Help Solve Your Condenser Tube Problems

$$R = \frac{Dvp}{u} = \frac{DG}{u}$$

. . . and the combined experience of the men who serve Scovill heat exchanger customers is almost sure to equal a practical, economical solution of any tube difficulties you may encounter.

Much of this combined knowledge is contained in our new Heat Exchanger Tube Manual; but beyond that, you'll find the man *between the lines* well qualified to help you in your special problems whether it be corrosion of metals, methods of installation, fluid flow, heat transfer, or specifications.

Should that problem involve Reynolds' number . . . the transition point between viscous and turbulent flow . . . dezincification . . . vaporization . . . or merely the standard tolerances for seamless tubing . . . we can probably promptly supply exactly the information you need — background information that springs from the practical experience of Scovill consultants who have helped to solve problems like yours.

The revised edition of the Scovill "Heat Exchanger Tube Manual" is reserved for distribution to engineers and other technical men whose positions frequently require them to have access to a source of material which covers many of the more unusual aspects of heat exchanger tube engineering and operation.

★ ★ ★ ★ ★ ★ ★

For an informative source for those problems having to do with the manufacture, material selection and installation of Condenser Tubes, Scovill's Service in Manuals has produced another booklet — "Scovill Condenser Tubes" available on request. Write to Scovill Manufacturing Company, 13 Mill St., Waterbury, Conn.

SCOVILL
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Scovill Condenser Tubes

ONE PRODUCT...THREE SERVICES

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steam line, when the contacts close, the solenoid in the safety device would be energized, tripping the dog, releasing the lever, closing the valve, and shutting down the turbine.

This same arrangement could be used to advantage on the discharge side of the pump. The pump must maintain a discharge pressure greater than boiler pressure, and any drop in pressure to or below boiler pressure would close the contacts in the gage, and operate the safety device as previously described.

An electric bell could also be connected in the circuit to give the operator an instantaneous alarm.

Bogota, N. J. FRED MEYER

Pressure Drop Causes Flashing of Water

WE MAY SURMISE from the wording of GLK's question, that the boiler-feed pump is one of several main pumps taking their suction from the discharge of booster pumps operating in parallel, as shown in the attached sketch. In all likelihood a closed heater is located between the booster and the main feed pumps so that the latter handles feedwater at a temperature of 300 to 375 F.

When one of the steam-turbine-driven feed pumps started with the suction valve closed, damage was inevitable. As soon as the pump was started, the action of the impeller created a pressure drop in the suction chamber causing the feedwater to flash into steam. The fact that a multistage boiler feed pump cannot run dry for any length of time is well known, and of course it resulted in the seizing of the pump at the running joints.

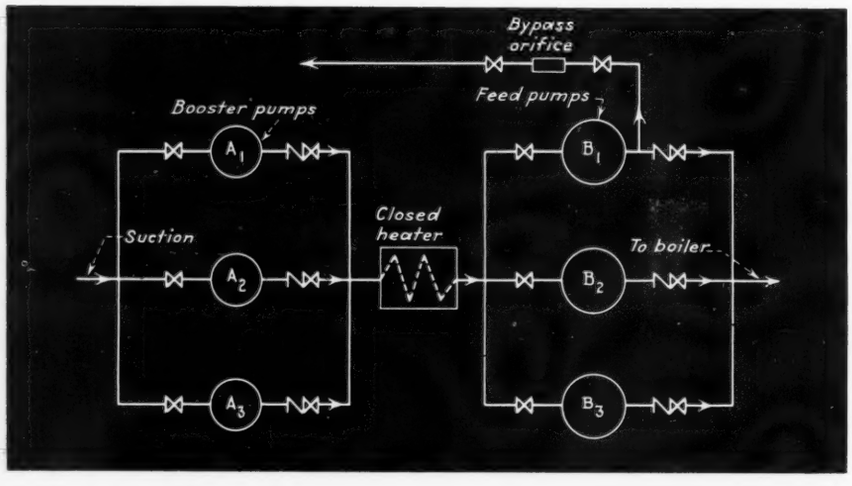
The pump turbine is equipped with an excess pressure governor and it was expected to prevent the occurrence of this trouble. The action of the governor, under these conditions, would be to speed the pump up in an endeavor to develop the full 950 psi pressure. The required speed would then exceed the setting of the overspeed trip mechanism and the turbine would come to a standstill. Since the action of the overspeed trip was not rapid enough, GLK feels that the overspeed setting should be lowered, close to the normal speed, thus introducing the new danger of a shutdown on a slight drop in suction pressure. The solution to the problem lies elsewhere than in speed control.

The first question which arises concerns whether or not it is necessary or even advisable to keep the suction valve closed at any time. These valves are installed for the purpose of inspection and repair. In order to maintain an idle pump at operating temperature, a constant flow of feedwater should be permitted to pass through the pump. This flow discharges from the pump either through a warm-up valve or through the recirculating bypass, held open for this purpose. A bypass is illustrated for one of the pumps only. While, in an emergency, a cold pump may be placed in operation without warming up, it should be heated up in the manner described for approximately 30 min before starting.

With the installation of this bypass line, the method of disposal will depend upon the feed cycle involved. While this line will serve as a warm-up connection, the primary purpose is to prevent operation at such low capacities that the resulting temperature rise becomes a definite danger.

It might be argued that the constant operation of the bypass on the idle main feed pump is wasteful. The flow through the bypass orifice under idle conditions is considerably less than when the main feed pump operates, as under the latter conditions the differential across the orifice is of the order of 950 psi while this differential is only 250 psi with the pump standing still.

South Orange, N. J. I J KARASSIK



Float Control On Pump Suction

TO PROTECT GLK'S PUMPS against damage by lack of water, I suggest a float control to operate a quick-closing valve when the water in the suction falls below a safe working level. As such pumps run at high speed, it is essential that they be flooded at all times during operation.

A high-pressure float-control tank and attachments suitable for this work may be purchased, but in event of inability to obtain these, I suggest one be made up from available material, as shown in the sketch on page 124.

Two small lines connect the float chamber with the pump suction. These lines have no valves because the level in this chamber must be the true level in the pump suction. Mount the float so that the valve trips as soon as the water level falls below the lower edge of the impeller suction or a little earlier. This may be determined by trial after installation.

Kearny, N. J. GEORGE MCNALLY

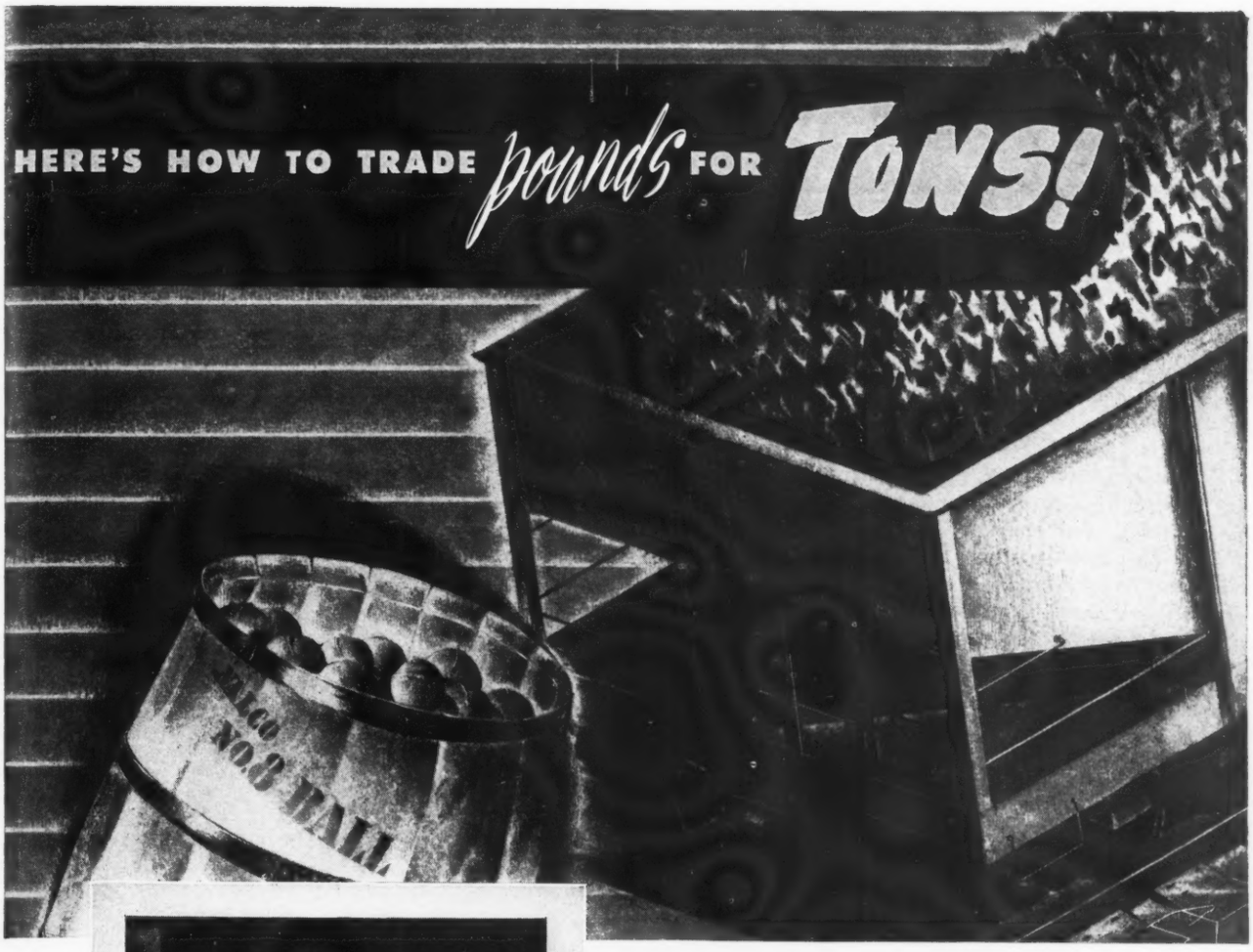
Motor-Operated Turbine Valve

GLK'S PROBLEM can be solved by installing a motor on the turbine valve and a switch on the pump-suction valve which would be closed only if the valve was wide open. This switch would be connected in the control circuit to motor and would prevent the steam valve from being opened by pushbutton unless the pump-suction valve was first opened. Other control equipment such as a float switch and pressure switches with maximum and minimum contacts could also be installed to prevent the pump starting unless filled with water at proper pressure. These would be connected in series in the circuit of the motor.

A switch on each of the pump valves, to operate only when valves are wide open, closing the circuit to a signal light should offer a sufficient reminder to the pump operator. Lights could be in duplicate, one at a central station and one at the steam valve. Switches would be in series. A sign should be

(*Continued on page* 148)

HERE'S HOW TO TRADE *pounds* FOR TONS!



In Nalco Laboratories, among the finest in the world, a staff of research chemists and engineers are continually developing newer and better methods of combating scale and corrosion.

Here, water treatment methods to meet the most difficult conditions are developed. No costly experimentation in your plant. No half-way measures — your scale problems will be under complete control. A continuous check report service insures this.

CONSERVE COAL THE *Nalco Way!*

AUTHORITATIVE sources have reported that 1/9 inch scale on boiler tubes can cause heat losses as high as 16%. That means a heavy waste of coal and loss of boiler capacity.

With the tremendous demands on American power plants, mining operations and railroad facilities, it is important that you investigate the possibility of trading *pounds* of Nalco feedwater treatment for *tons* of coal.

The Nalco System will keep your boiler tubes like new, eliminate heat losses due to scale, prevent carryover, foaming and priming and give you controlled blowdown.

Take the steps now to conserve time, money, manpower and materials. Write for a Nalco Survey of your plant.

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Canadian inquiries should be addressed to Aluminate Chemicals, Ltd., 555 Eastern Ave., Toronto, Ont.

THE COMPLETE WATER TREATING SERVICE*

*Plant Survey *plus* Laboratory Research *plus* Controlled Chemicals *plus* Continual Check Reports.

ARGUMENT CORNER

What Can I Do?

(The writer of the following letter has asked POWER *to publish it, omitting his name and the name of the plant, for obvious reasons. He is a member of the NAPE, and is seeking the answer to a perplexing problem. Suggestions from readers are invited, particularly those located in New York or familiar with New York conditions. All replies received will be forwarded to the writer of the letter and some of special interest may be published in* POWER*—Editor.)*

I am 38 years of age, married with two children. I am in charge of all mechanical maintenance in an institution in Brooklyn, New York, for the past six years. I have held such a position that they call me chief engineer but I am not because I have no stationary engineer's license. For a number of years I have had unlimited refrigeration, oil and standby permits. My salary is $45.00 per week. My original trade was blacksmith. I have worked in machine shops for a few years and from 1931 to date I have been in this line and in low-pressure boilers, refrigeration, air conditioning, pumping, elevators and electricity. In short, I have been a building maintenance man.

I would like to step a little higher and would be very willing to learn in larger plants, either power plants or air-conditioning plants, in hotels or office buildings, but I cannot get in because I lack a stationary license. Moreover, I am not qualified for examination because I have not spent five years in New York City under a licensed engineer. What is one to do under such circumstances?

I can get a fireman's job under a licensed man at about $25.00 or $28.00 per week, but as you can readily see, that is not for me. How can I qualify for examination? I have a good boss and a good position, but I have reached the limit in this class of building and I most certainly feel that I have had enough experience, and with a little tutoring could make myself useful in larger plants and at the same time improve my own position and do my bit in this great emergency.

What Caused Ruptured Feed Trough?

WE RECENTLY OPENED a watertube boiler for an internal inspection. On removing the manhole plate, and crawling into the drum, we found a peculiar hump on the feed trough. On closer inspection, it was found that the longitudinal seam of the trough had burst outward, as shown in the sketch, tearing the rivet head through the metal sheet.

This trough is of the conventional design shaped similar to an inverted torpedo tube, open at the end where the internal feed line enters, and closed at the other end.

The boiler operates at 125 psi and is equipped with a feedwater regulator. Feedwater comes from an open heater which delivers water with a temperature varying from 110 F to 208 F. Under the worst operating conditions feedwater of 110 F could be delivered to the boiler when the boiler water temperature is 345 F.

Was this trouble caused by low water, when a sudden rush of cold water fed to the boiler, or was it caused by a low water condition, brought on when both the boiler and feed trough were being blown down, with an abrupt closing of the blowdown valves?

Grand Rapids, Mich. J M GORRIE

Fusible Plugs For Air Compressors

IN THE APRIL, 1942 issue of POWER, page 110, ten rules for the safe operation of air compressors were listed. I would like to offer a few comments on rules 2 and 5.

On discussing the subject of fusible plugs with several well-known compressor manufacturers we found that they were quite unfamiliar with the subject. Information from a boiler insurance carrier states that the Massachusetts Department of Public Safety recommended the use of fusible plugs back in 1931—see page 8 of *Air Tank Regulations, Form J*—March, 1931—but we do not know if the rule is still in force. Some authorities regard fusible plugs as being quite unreliable because the fusing temperature varies rather widely in service and their use was, therefore, dropped rather generally.

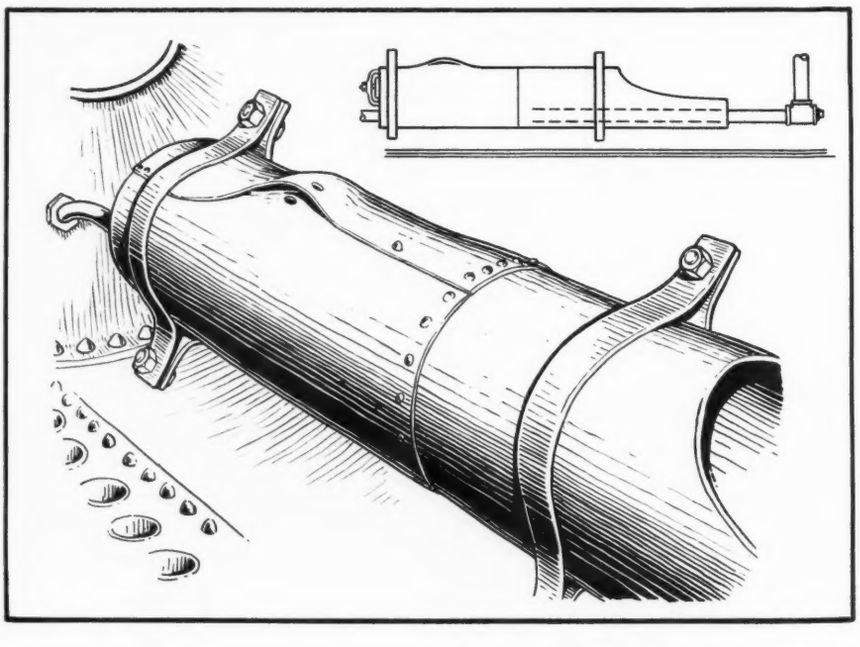
As to rule 5 there is also a noticeable hesitancy on the part of compressor manufacturers to approve oil traps. Their recommendation is, generally, to put nothing between the compressor and receiver, except an aftercooler, for safety.

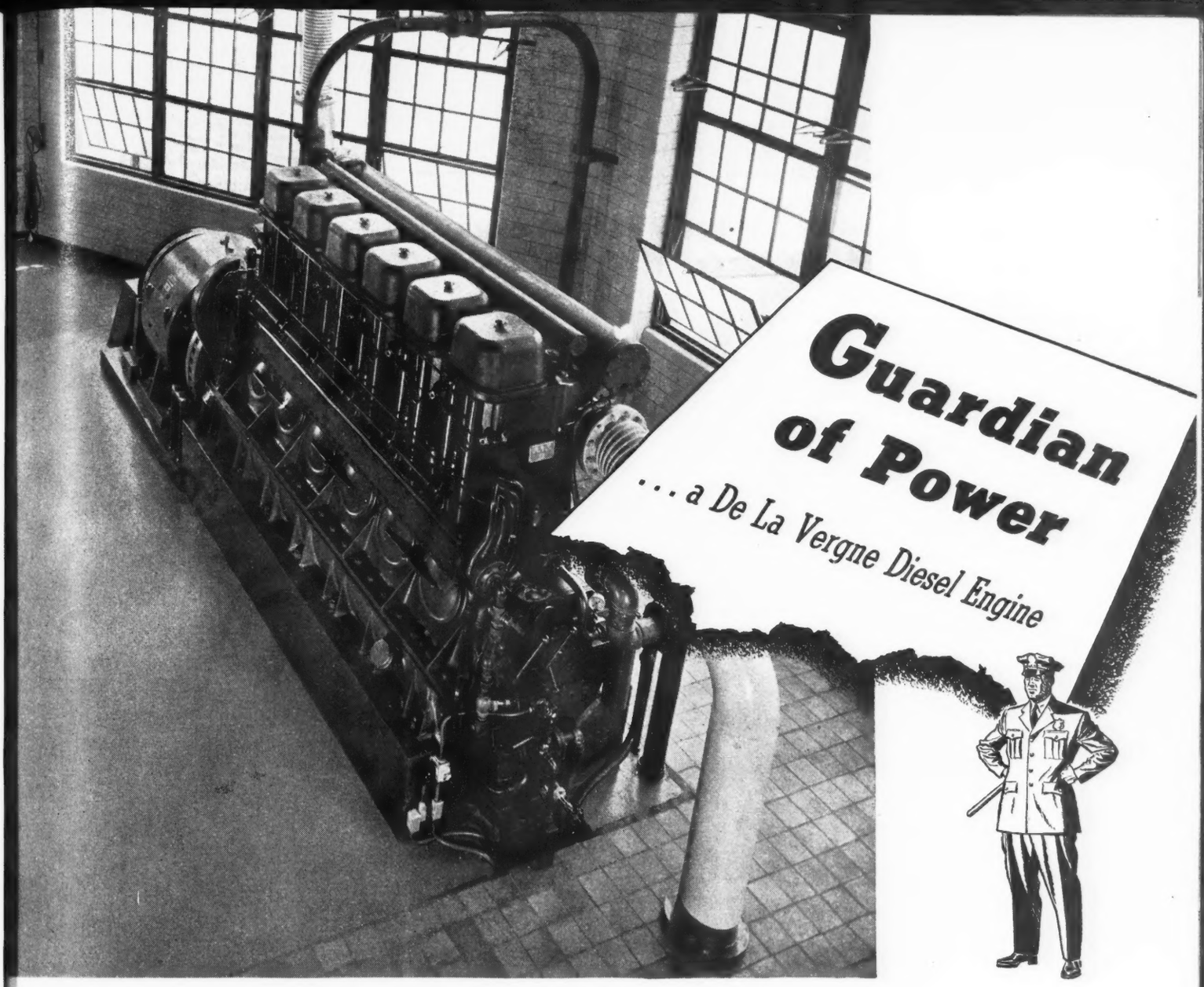
We operate many compressors and, although we have not had an explosion up to this time, we are very much interested in all rules for safe operation. Since there seems to be a wide difference of opinion regarding rules 2 and 5, we should like very much to have your comments.

Pittsburgh, Pa. A L KNOCHY

The two points raised by Mr Knochy are important because they deal with

(Continued on page 150)





De La Vergne built the first commercially successful oil engine in America in 1893 and since that time has manufactured dependable diesel engines for hundreds of applications. In providing low cost power for stationary service installations, De La Vergne Diesel Engines have an exceptional record of economical operation and maintenance.

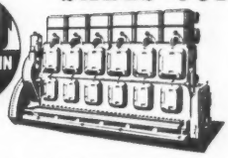
Today's production requirements demand unfailing, uninterrupted power supply. Installations of De La Vergne Diesels are meeting this demand in central stations, industrial and commercial plants, mills, mines, and cold storage plants throughout the nation.

Engineered and designed to fulfill specific power needs, De La Vergne Diesels range in size from 200 bhp to 1,500 bhp. Low maintenance costs, long life, and unusual quietness of operation are features of all De La Vergne 4-cycle diesel engines.

Whatever your power problem is, it will pay you to consult a De La Vergne engineer. The combined knowledge and experience gained in 49 years of diesel engine manufacturing is utilized in the solution of every new problem.

BALDWIN
De La Vergne
SALES CORP.

BLW
THE BALDWIN GROUP



SUBSIDIARY OF THE BALDWIN LOCOMOTIVE WORKS • PHILADELPHIA

POWER LINES

Chamberlain Named Jenkins Sales Manager

Charles C Chamberlain has been named general sales manager of Jenkins Bros, according to announcement by Farnham Yardley, president of the company. Mr Chamberlain has been publicity director of Jenkins Bros since 1940.

Mr Chamberlain came to Jenkins Bros in 1929, on graduation from

Charles C Chamberlain

Hamilton College. Starting as an assistant in the advertising department, he was appointed advertising manager in 1932, and advanced to publicity manager in 1940.

The new general sales manager will make his headquarters at the general offices of the company, 80 White St., New York.

Facts on Wartime Care of Rubber V-Belts

The Allis-Chalmers Mfg Co has just published a new handbook—"Plain Facts on Wartime Care of Rubber V-Belts," which aims to make complete sense of the entire V-belt maintenance story.

It begins with the anatomy of a V-belt and principle of a V-belt drive, and ends with post mortems on actual damaged V-belts. How the anatomy of a V-belt affects its maintenance, how to obtain proper V-belt tension, what to do about worn sheaves, what determines the life expectancy of V-belts, these are some of the facts revealed in the new handbook. The new book applies to all makes of V-belts, contains no advertising, and is available without charge on request to the company.

Huntley Station Tests New Plant Addition

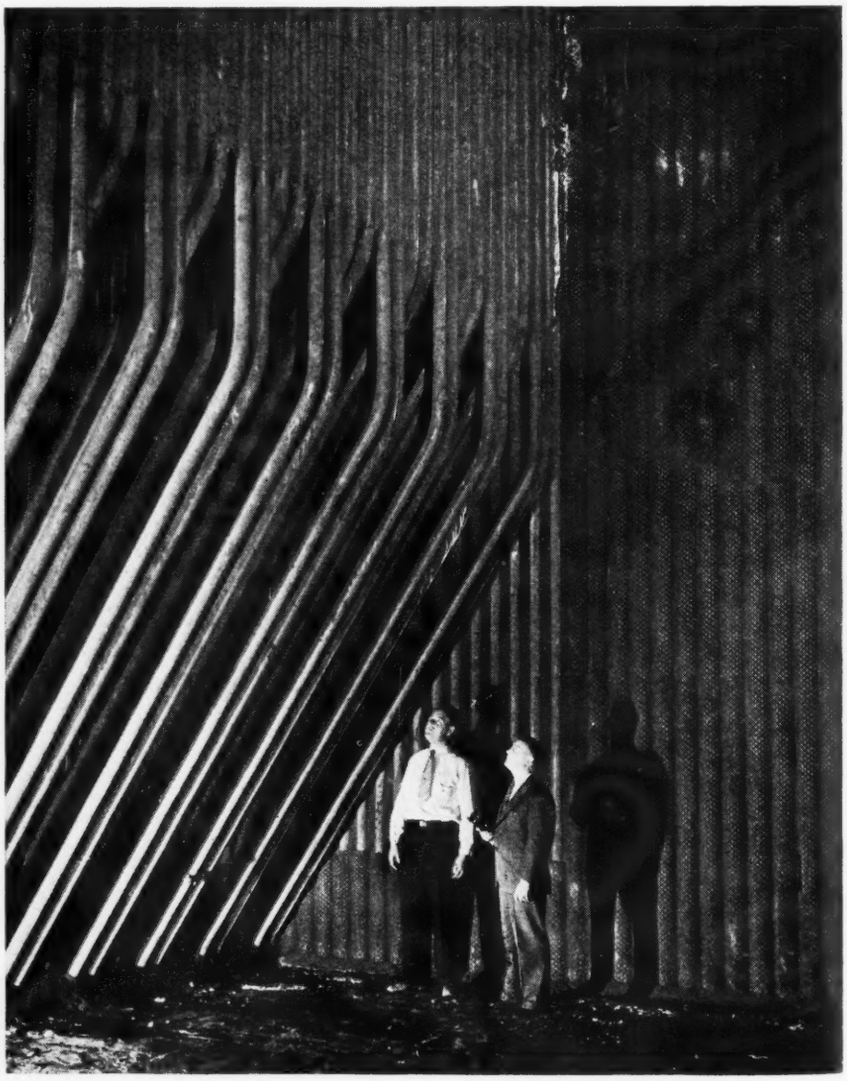
Enough electric power to light the homes and run the industries of a city the size of Syracuse, will be added to the Niagara Hudson System power pool within a month, Col Wm Kelly, president of Buffalo Niagara Electric Corporation, announced, as preliminary boiler tests were completed in the new $7,000,000 addition to the 60 cycle plant at Huntley Steam Station on River Road.

The new addition will be completed on the schedule announced twenty-three months ago. At that time, the project was undertaken to meet both normally expected growth of power demands and anticipated acceleration of industrial demands resulting from adoption of the Lend Lease program, then under Congressional consideration.

Order for building the 60-cycle steam driven turbine generator—one of the largest condensing units ever built in a single casing to use steam at high pressure—was given to the turbine manufacturers in October, 1940. Construction of the unit required 19 months. Steam is delivered to the turbine at a temperature hot enough to burn wood, almost hot enough to cause the metals of the turbine to glow, and twice as hot as is required to melt tin. To improve its efficiency, the generator is hydrogen cooled, a relatively new feature in a unit of this size and type. When under full load, a kilowatt of power will be produced for each 0.85 pounds of coal.

The boiler, supplying steam to the turbine, weighs four million pounds and has a thermal efficiency of 88% at maximum rating. It will be fueled by

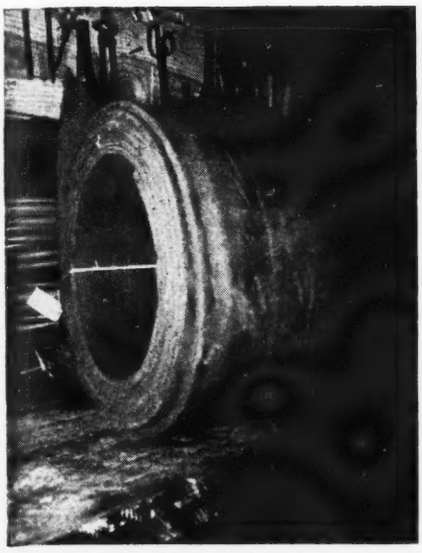
(*Continued on page* 186)



Internal view of the nine-story boiler at the Huntley station. Inspecting the interior are, left to right: Daniel P Wendel, assistant operating supervisor, and, Franklin S Helfter, assistant superintendent

Old rubber belts made into new

Save rubber — save money; don't throw away any rubber transmission or conveyor belting until you investigate



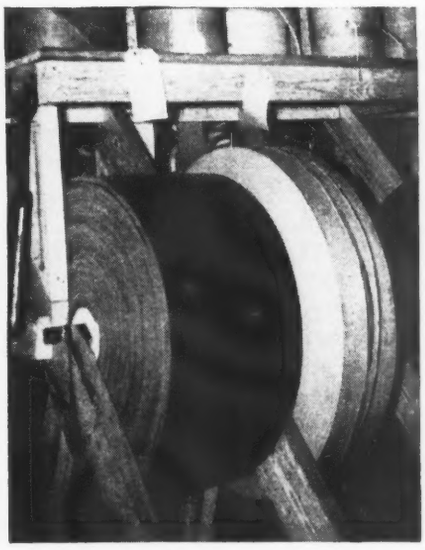
Worn belt ready to junk. Don't do it!

Slitting old belt into 2 narrower belts.

Ripping off worn pulley ply.

Preparing for Plylock Splice. Damaged spots can be patched, ready for vulcanizing.

Vulcanizing repairs or making belts endless by Plylock method.



Two belts almost good as new — for a few dollars.

Another B. F. Goodrich suggestion to save rubber

It's as easy and simple as that! B. F. Goodrich distributors are helping to conserve vital rubber by making new belts from old. If edges are worn, they are trimmed, and the old belt slit into two or more narrower widths for other drives. If top or bottom is worn, it is peeled off to the good plies underneath. If it is a conveyor belt and original width must be maintained, cuts and tears on the edges can be repaired.

Then vulcanized repairs are made and the new belts may be made endless (on the drive itself if you wish) by the Plylock Splice. A vulcanized repair is a *permanent* repair. It will last as long as the belt.

In this way months and even years of service are being saved from belts that had been headed for the junk pile. If you have any old, worn belts in your plant, call in your B. F. Goodrich distributor or write us for full details. Also write us for free copies of a series of folders on how to conserve all industrial rubber products you use; if you use conveyor belts we will also send you a Belt Maintenance Manual full of helpful information on making conveyor belts last longer. *The B. F. Goodrich Company, Industrial Products Division, Akron, Ohio.*

B.F. Goodrich

FIRST IN RUBBER

ENGINEERS' BOOKSHELF

Mathematics

MATHEMATICS OF MODERN ENGINEERING (Volume II, 1942). *By Ernest G Keller, mathematics staff engineer for Lockheed Aircraft Corp. 309 pages 6 x 9 in. One of a series for the advanced course in engineering of the General Electric Co. Price $4.*

The second of three (projected) books of the kind of mathematics used by engineers and physicists in daily research and practice. The author proceeds to outline "mathematical engineering" as the tool of all research and design in rotating machines, airplane motions, locomotive oscillations, vibration, aerodynamics, hydrodynamics, electrodynamics and elasticity. For the graduate student, a new collection of the math he will someday need; for abstract research, a valuable reference.

Electricians' Handbook

AMERICAN ELECTRICIANS' HANDBOOK (Fifth Edition, 1942) *By Terrell Croft. Revised by Clifford C Carr, Head of Electrical Engineering Department, Pratt Institute. Published by McGraw-Hill Book Co, 330 West 42nd St, New York, N. Y., 1634 pages, 5 x 7½ in., illustrated, fabricoid binding. Price $5.00.*

Like wine this book improves with age. The fourth edition had 1040 pages compared to the present one, 1634 pages of practical descriptions, information and data to aid electrical men in intelligently selecting and installing electrical equipment and materials. In the preparation of this edition the entire work has been revised and expanded to be in accordance with latest good practice and the 1940 National Electrical Code. The book has been expanded from six to ten divisions under the headings: fundamentals, properties and splicing of conductors, circuits and circuit calculations, general electrical equipment and batteries, generators and motors, transformers, outside distribution, interior wiring, electric lighting, wiring tables. One new division has been devoted to a comprehensive treatment of the properties of and splicing of conductors. The subject of circuits and circuit calculations has been allotted a separate division, instead of being included as part of the one on fundamentals. Another new division deals with general electrical equipment

(*Continued on page* 180)

1907 MOTOR STILL RUNS MACHINE TOOLS

All of the machine tools at the small Arlington Machine Works, near Boston, have been powered by the same induction motor for the past 35 years, according to S P Birch, proprietor. Rated at 7.5 horsepower for 200-volt service, the motor, built by Westinghouse, now, as it did during the last war, supplies motive power for production of critical war materials. At the present time the motor operates 22 machine tools, including five engine and screw-cutting lathes with swings of from 13 to 42 in., two planers with 13- and 6-ft beds, milling machines, shapers and grinders. All are belted to a main line shaft. The original bearings have not been replaced after more than five million revolutions of the motor shaft

Changing your address soon? • • •

You will help us give you the good service that is your due by notifying us at once of your change of address. Often the monthly issues of POWER go out of print almost immediately after publication, preventing us from supplying issues that may have been misdirected. Prompt notification of address changes that have been made or will be made prevent your missing a single one of the big valuable monthly issues of POWER.

. . . if so, please fill in and return adjoining coupon.

Name .....

Old Address .....

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New Address .....

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New Co. ..... *Position*.....

(Send to Circ Dept, POWER, 330 W 42nd St, New York, N. Y.)

Standard
POWER PIPING HANGERS
Help to clear production bottlenecks

Type 1 Functional Hanger on which the entire line of Power Piping Hangers is founded. The characteristics of this hanger fulfill the need expressed by 85% of the entire present day use for spring hangers.

A letter from the Simplifications Branch of the Conservation Division, War Production Board, to designers and contractors in the field of power plant construction, states:—

"Most of the materials used in such installations are on the critical list and the inclusion of special designs will substantially retard production in bottleneck industries." It was further stated that the war effort may compel the government to prohibit the production of "specials".

•

Power Piping Functional Hangers are standard.

•

They fit all needs.

•

They are saving thousands of man hours in design, fabrication and erection of piping systems.

Send for Bulletin 1863 which illustrates and describes the entire Power Piping Line of standard Functional Hangers and various combinations to meet special conditions.

BLAW-KNOX COMPANY
POWER PIPING DIVISION
1525 PENNSYLVANIA AVE., PITTSBURGH, PA.

ENGINEERS, FABRICATORS AND ERECTORS OF COMPLETE PIPING SYSTEMS

THE NIGHT WATCH maintains a sharp lookout for incoming messages from far distant units of the battle line. Seamless Steel Tubing is used for instruments like these and for Navy range finders and listening devices.

CALCULATING THE HEIGHT OF AIRPLANES when they are only tiny specks in the sky. Considerable amounts of Shelby Seamless Tubing are being used for army range finders because of its strength, accuracy, and light weight.

NATIONAL SEAMLESS

Eyes and Ears for the Army and Navy are made of steel tubes!

HOW would you like to climb into the control tower of a battleship and look *through* the mechanical eyes which can spot an enemy ship miles beyond unaided sight? Or go into the crowded control room of a destroyer and listen through the mechanical ears which reveal the heart throbs of a submarine lurking beneath the sea? Or visit an observation post for our land forces where the *tubular* range finder is posted to spot enemy artillery, and the sensitive sound detectors to catch the drone of approaching aircraft long before it can be seen?

Maybe you didn't know it, but these "eyes and ears" which are largely responsible for the surprising accuracy of American gun fire are built with substantial amounts of *seamless* steel pipe and tubing.

But vital and numerous as these devices are, they represent only a part of the amazing contribution of pipe and tubing to our military operations. The ships to be built in 1942-43 will use enough pipe and tubes to reach one and a half times around the world! Powder plants, arsenals, factories, defense housing and equipment require a staggering tonnage, while millions of shells, demolition bombs, tank parts, and aircraft accessories create an amazing total in the war effort.

That's why the vast facilities of NATIONAL Tube Company follow 'round the clock with an endless stream of production. That's why the processes which made NATIONAL Seamless famous in times of peace are so valuable today. And that's why before you ask the question, "What about pipe and tubes?", you already have the answer. NATIONAL Pipe and Tubes have definitely gone to war!

NATIONAL TUBE COMPANY

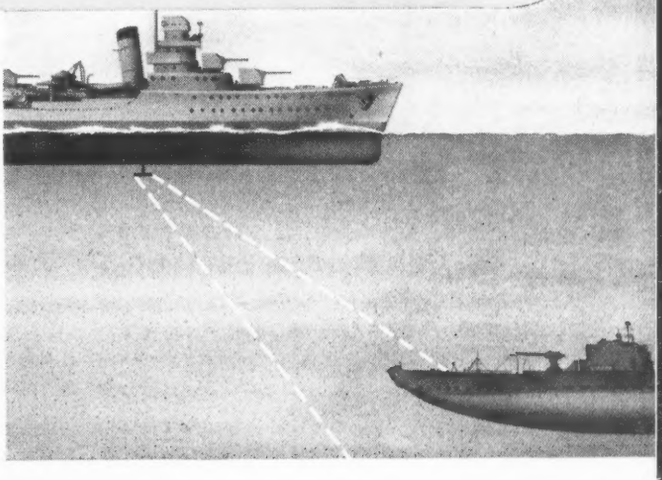
Pittsburgh, Pa.

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
United States Steel Export Company, New York

UNITED STATES STEEL

← **SUPERSENSITIVE** ears for detecting airplanes miles away. Shelby Seamless Tubing is used for sound conduction equipment mounted on a framework of seamless pipe.

→ **DETECTING SUBMARINES** without seeing them. Listening devices using seamless tubes are used to locate the direction of submarines.



PIPE AND TUBES

Faster Selection of Steam-Pipe Thickness

III — Schedules 120, 140, 160

Maximum working pressures for seamless carbon-steel pipe, ASTM A–106–41, Grade B, silicon killed

Working temperature, F.				150	250	350	400	450	500	550	600	650	700	750	800	850	900	950	1000
Allowable working stress, S, psi				15,000	14,400	13,800	13,400	13,200	12,900	12,600	12,300	12,000	11,400	10,400	9,100	7,400	5,600	3,800	2,000
Pipe size, inches	Pipe OD, inches	Nominal wall thickness, inches	Minimum wall thickness, inches																
Schedule 120																			
4	4.5	0.437	0.382	2120	2030	1950	1890	1860	1820	1780	1740	1700	1610	1470	1290	1050	790	540	290
5	5.563	0.500	0.437	2010	1930	1850	1800	1770	1730	1690	1650	1610	1530	1390	1220	990	750	510	270
6	6.625	0.562	0.492	1940	1860	1780	1730	1710	1670	1630	1590	1550	1470	1340	1180	960	730	490	260
8	8.625	0.628	0.718	1960	1880	1800	1750	1730	1690	1650	1610	1570	1490	1360	1190	970	730	500	260
10	10.75	0.843	0.738	1880	1810	1730	1680	1660	1620	1580	1540	1510	1430	1310	1140	930	700	480	250
12	12.75	1.000	0.875	1910	1830	1760	1710	1680	1640	1600	1570	1530	1450	1320	1160	940	710	490	260
14	14.0	1.062	0.929	1850	1780	1710	1660	1630	1600	1560	1520	1480	1410	1290	1130	920	690	470	250
Schedule 140																			
8	8.625	0.812	0.711	2250	2160	2070	2010	1980	1930	1890	1840	1800	1710	1560	1370	1110	840	570	300
10	10.75	1.000	0.875	2260	2170	2080	2020	1990	1950	1900	1860	1810	1720	1570	1380	1120	850	580	310
12	12.75	1.125	0.984	2170	2080	1990	1940	1910	1860	1820	1780	1730	1650	1500	1320	1070	810	550	290
14	14.0	1.250	1.094	2210	2120	2030	1970	1940	1900	1860	1810	1770	1680	1530	1340	1090	830	560	300
Schedule 160																			
½	0.840	0.187	0.164	4070	3910	3740	3630	3580	3500	3420	3340	3250	3090	2820	2470	2010	1520	1030	550
¾	1.050	0.218	0.191	4040	3880	3720	3610	3550	3470	3390	3310	3230	3070	2800	2450	2000	1510	1030	540
1	1.315	0.250	0.219	3860	3700	3550	3450	3400	3320	3240	3160	3090	2930	2680	2340	1910	1440	980	520
1¼	1.660	0.250	0.219	2790	2680	2570	2500	2460	2400	2350	2290	2240	2120	1940	1700	1380	1050	710	380
1½	1.900	0.281	0.246	2870	2750	2640	2560	2520	2470	2410	2350	2300	2180	1990	1740	1420	1070	730	390
2	2.375	0.343	0.300	2970	2850	2740	2660	2620	2560	2500	2440	2380	2260	2060	1810	1470	1110	760	400
2½	2.875	0.375	0.328	2750	2640	2530	2460	2420	2360	2510	2250	2200	2090	1910	1670	1360	1030	700	370
3	3.5	0.437	0.382	2720	2610	2500	2430	2390	2340	2280	2230	2180	2070	1890	1650	1340	1020	690	370
4	4.5	0.531	0.465*	2900	2780	2670	2590	2550	2490	2440	2380	2320	2200	2010	1760	1430	1090	740	390
5	5.563	0.625	0.547*	2820	2710	2600	2520	2490	2430	2370	2320	2260	2150	1960	1720	1400	1060	720	380
6	6.625	0.718	0.628*	2750	2640	2530	2460	2420	2360	2310	2250	2200	2090	1910	1670	1360	1030	700	370
8	8.625	0.906	0.793*	2730	2620	2510	2440	2410	2350	2300	2240	2190	2080	1900	1660	1350	1020	700	370
10	10.75	1.125	0.984*	2760	2650	2540	2470	2430	2380	2320	2270	2210	2100	1920	1680	1370	1030	700	370
12	12.75	1.312	1.148*	2760	2650	2540	2470	2430	2380	2320	2270	2210	2100	1920	1680	1370	1030	700	370

Maximum working pressures for seamless carbon-molybdenum steel pipe, ASTM A–206–41T

Working temperature, F				650	700	750	800	850	900	950	1000
Allowable working stress, S, psi				11,000	11,000	11,000	10,750	10,500	10,000	8,000	5,000
Schedule 160											
½	0.840	0.187	0.164	2990	2990	2990	2920	2850	2720	2180	1360
¾	1.050	0.218	0.191	2960	2960	2960	2890	2830	2690	2160	1350
1	1.315	0.250	0.219	2830	2830	2830	2770	2700	2570	2060	1290
1¼	1.660	0.250	0.219	2060	2060	2060	2010	1960	1870	1500	940
1½	1.900	0.281	0.246	2100	2100	2100	2050	2010	1910	1530	960
2	2.375	0.343	0.300	2180	2180	2180	2130	2080	1980	1590	990
2½	2.875	0.375	0.328	2020	2020	2020	1970	1930	1830	1470	920
3	3.5	0.437	0.382	2000	2000	2000	1950	1910	1820	1450	910
4	4.5	0.531	0.465*	2130	2130	2130	2080	2030	1930	1550	970
5	5.563	0.625	0.547*	2070	2070	2070	2020	1980	1880	1510	940
6	6.625	0.718	0.628*	2020	2020	2020	1970	1930	1830	1470	920
8	8.625	0.906	0.793*	2010	2010	2010	1960	1920	1820	1460	910
10	10.75	1.125	0.984*	2030	2030	2030	1980	1940	1840	1480	920
12	12.75	1.312	1.148*	2030	2030	2030	1980	1940	1840	1480	920
14	14.0	1.406	1.230*	1980	1980	1980	1940	1890	1800	1440	900

* Table values of working pressure are calculated from the thick-wall formula since the minimum wall thickness is equal to or greater than 10% of inside diameter of pipe.

For Schedules 10–100 inclusive, see Data Sheets 121, 122.

By P H Hardie, Sanderson & Porter

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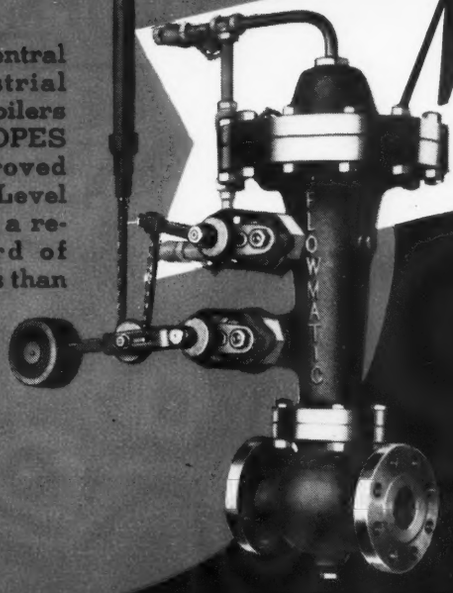
More than-- FEED WATER CONTROL

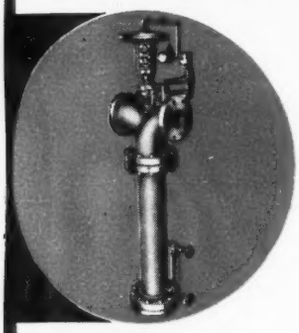
COPES

• Over 600 large central station and industrial type water tube boilers are serviced by COPES Flowmatic, the proved Steam Flow-Water Level Regulator. This is a remarkable record of acceptance for less than five years on the market. Write for general catalog on the complete line of COPES Feed Water Regulators.



MENTION COPES and engineers think of boiler feed water control—COPES designed and built a complete line of Pump Governors even before COPES Feed Water Control was introduced. Over 33 years of valve control experience has produced a wide line of allied equipment for the flow control of steam, gas, liquid and chemicals, a few of which are illustrated below. Consult COPES for modern valve control equipment in your plant.

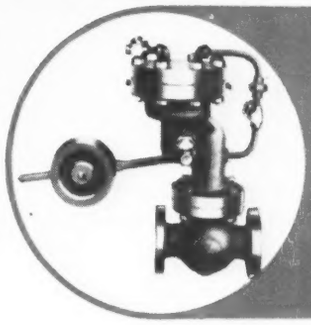
COPES Desuperheaters



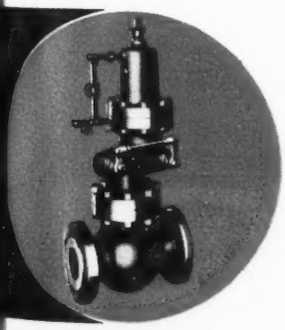
COPES Desuperheaters completely or partially remove the superheat from steam to be used for process or for auxiliaries designed for reduced temperature steam. This ruggedly built Desuperheater utilizes the spray principle. Sizes from 2" through 14"—Bulletin 405.

COPES Differential Valves

These valves provide effective differential pressure control in the individual boiler feed line where any type of feed regulator is used. May be used for other services to maintain a constant differential pressure across control valves or orifices. Write for bulletin.



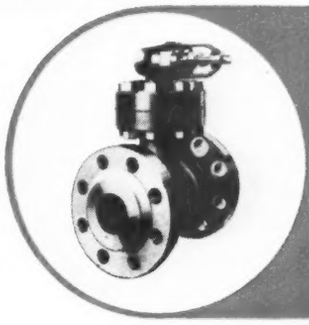
COPES Pump Governors



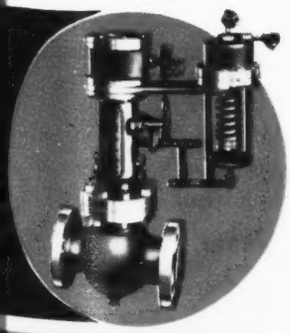
COPES Pump Governors control within close limits any excess pressure from 15 to 150 pounds. Used on simplex or duplex pumps and on turbine or motor-driven centrifugal pumps, sizes 1½" through 6". Write for bulletin.

COPES Balanced Valves

This popular COPES BI Valve, part of so many COPES products, is widely used throughout industry. They are activated by floats, temperature, pressure or any other type of controllers to control the flow of any kind of liquid, steam or gas. This COPES BI Valve is by far more perfectly balanced than any other make of valve of which we know about. Write for data.



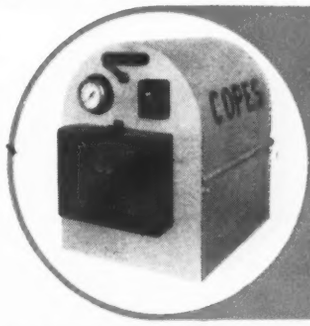
COPES Reducing Valves



Types 3-SH-2C, illustrated, designed for water or steam service where the reduced pressure limits are within 15 to 250 lbs. p.s.i. gauge. Any desired degree of sensitivity is obtained through adjustable levers. Available in many styles and sizes from 1" through 14". Write for bulletin.

COPES Pumping Units

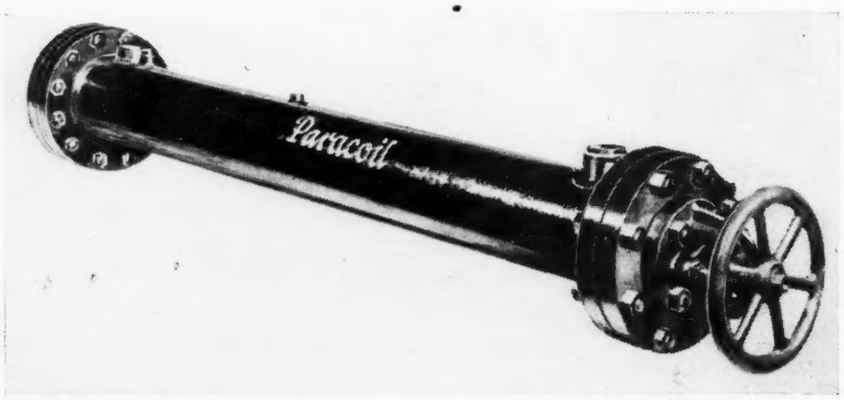
COPES Motor Driven Dual Pumping Units, a dependable source of operating pressure for relay-operated valves—eliminates need of running air, oil or water pressure lines from a distant point. Either pump may be used as the standby unit. Adaptable for other services within its capacity of three gallons per minute at 75 pounds pressure. Write for data.



COPES FEED WATER REGULATORS AND ALLIED EQUIPMENT

NORTHERN EQUIPMENT COMPANY · 1121 GROVE DRIVE, ERIE, PA.

WHAT'S NEW IN PLANT EQUIPMENT



Self-Cleaning Heat Exchanger

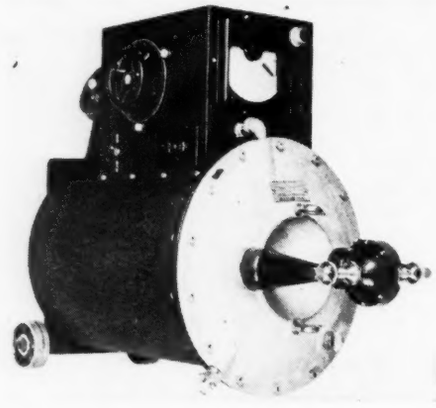
PARACOIL SELF-CLEANING tubular heat exchanger eliminates necessity of manually or chemically cleaning the apparatus. A few turns of a handwheel, shown in the photograph, while the heat exchanger is in operation, restores the surface in contact with the medium being heated or cooled to its original clean condition. Paracoil suitable for liquids of a viscous nature containing organic or inorganic substances. It can be supplied in various commercial sizes and of materials to resist the corrosive action of the material being heated or cooled. There is no internal mechanism to get out of order or require replacement because of normal wear. If during the life of the apparatus replacement of the heating surface is necessary, a new tube bundle can be supplied and installed. Cleaning device can be operated as often as desired or as found necessary for the particular medium being heated or cooled. *Davis Engineering Corp, 1064 East Grand St, Elizabeth, N. J.*

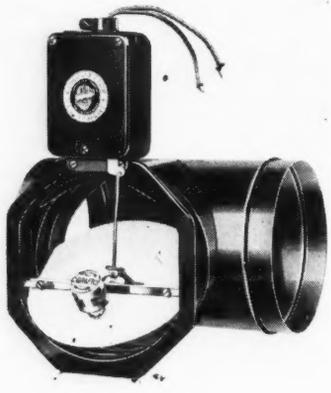
Testing Set

IMPROVED 35,000-VOLT oil and insulation testing set which can be converted for high-potential tests on a variety of materials and products announced. Set consists of a 2-kva 35,000-volt liquid-immersed testing transformer; an air-cooled variable-voltage autotransformer; an air circuit breaker for opening the circuit after the test is completed; an oil-testing receptacle; a pushbutton station; and a double-range voltmeter for accurate indication of the insulation breakdown voltage. The oil-testing receptacle contains the test gap and is so mounted on the high-voltage terminals that simply tilting the receptacle empties the tested oil into a drain pan in the transformer cover. Oil is then withdrawn from the pan through a drain cock. *General Electric Co, Schenectady, N. Y.*

Draft-O-Stat (below, right)

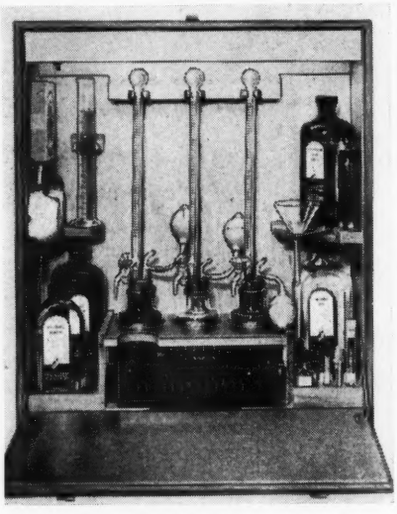
MODEL BM MOTORIZED Draft-O-Stat is standard Model B with the addition of electrical controlling motor. Barometric draft controls are balanced counterweighted metal air valves, mounted usually on the flue pipe. Chimney furnishes constantly fluctuating draft of vacuum. Barometric control functions to "balance out" these fluctuations. They insure a steady and changing rate of draft or vacuum in the furnace to draw up through the furnace or boiler the heated gases of combustion at a minimum rate of travel. By so regulating the flow of these gases a maximum utilization of the useful heat is assured. Unit is of welded-steel construction, with polished fittings and adjustable mechanism. Furnished in two sizes, small size for 6 and 7-in. flue pipes, and larger size for 8-, 9- and 10-in. flues. *Combustion Equipment Div, The Hotstream Heater Co, Cleveland, Ohio.*





Testing Equipment

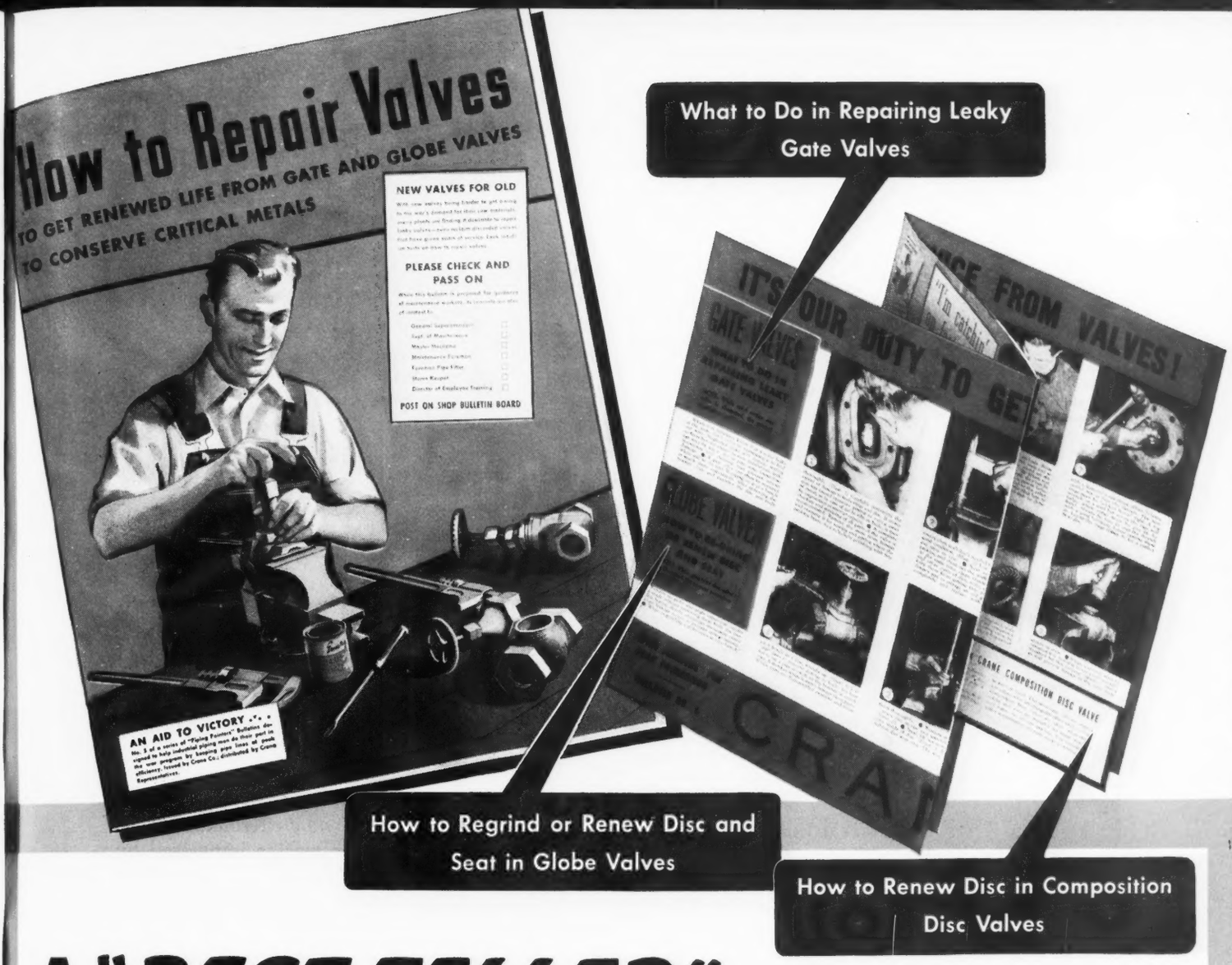
THESE "A" SERIES TEST SETS include the necessary chemicals and apparatus for determining hardness, alkalinities, chlorides, phosphates and sulfites in water, when any two, three or four of these tests are required. All chemicals and apparatus contained in a special cabinet held in a secure position ready for instant use. A portion of open cabinet door forms a convenient acid-resistant laboratory work table and a fluorescent light provides correct illumination for the tests. *W H and L D Betz, Gillingham and Worth Sts, Frankford, Philadelphia, Pa.*



Welding Positioner

RANSOME POSITIONER designed to handle loads up to 22½ tons with a center of gravity 12 in. from the table top. The

(*Continued on page* 162)


How to Repair Valves
TO GET RENEWED LIFE FROM GATE AND GLOBE VALVES
TO CONSERVE CRITICAL METALS
NEW VALVES FOR OLD
PLEASE CHECK AND PASS ON
POST ON SHOP BULLETIN BOARD
AN AID TO VICTORY
What to Do in Repairing Leaky Gate Valves
How to Regrind or Renew Disc and Seat in Globe Valves
How to Renew Disc in Composition Disc Valves

A "BEST TELLER" FOR PIPING MEN

Look at the timely subjects covered in "Piping Pointers" Bulletin No. 5. What is more important to piping men—NOW—than knowing how to repair valves for better and longer service—to keep war production lines flowing—to conserve critical metals! Frankly, we don't know of any other current source of such vital information.

"Piping Pointers" are designed to help you train men for the big maintenance job that faces industry at war. Based on the vast experience of America's leading producer of valves and fittings—CRANE—their content is fully accurate and practical. Even veteran workers use "Piping Pointers" to keep up-to-date on the *kinks* of the trade.

FREE TO ANY PLANT

In "Piping Pointers," Crane shares its basic information with all industries producing for Victory. This service is *absolutely free,* yet countless plants have testified to its inestimable value in maintenance shops and employee training schools. If you're not using "Piping Pointers," you owe it to Victory to let your Crane Representative arrange for your supply.

HOW TO KEEP YOUR PLANT GOING WITHOUT INTERRUPTION!
TIPS ON VALVE TRIM
TO HELP KEEP PIPING ON THE JOB
HELPFUL HINTS ON CHOOSING VALVES FOR BETTER PIPING SERVICE

Five "Piping Pointers" Bulletins have been published to date. To meet the demand, extra supplies of all editions have been printed. Get the entire series now *—when you need them* most. *First come first served.*

CRANE

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VALVES • FITTINGS • PIPE
PLUMBING • HEATING • PUMPS

NATION-WIDE SERVICE THROUGH BRANCHES AND WHOLESALERS IN ALL MARKETS

Every Drop.....

Several years ago, we first heard the story of the doctor head of a hospital who proudly showed a visitor his new power plant, explaining that now the building got its power free as a byproduct of its steam. When the visitor asked a little later how much steam cost, the doctor blandly explained that it was free too—a byproduct of power generation.

That kind of muddled thinking and disregard of actual costs is typical of American prodigality. Our generation hasn't done much saving—we haven't had to. When our golf balls were nicked, our shoes shabby, or a pan began to leak, we simply replaced them. New things were cheap and easy to get. We ran our plants the same way in good times—and shut them down in bad.

Now all that is changed. The simplest and commonest of supplies can't be gotten for love or money. Even fuel is rationed. If a part lets go, the chances are we can't replace it—or have to wait for months unless our plant is directly tied in with war production. We are forced to high plant economy, whether or no. Further, we will be forced to become better engineers, whether or no.

We've got to be part of a nation of string savers and paper storers. We who have always had so much must now get along with little. After all, it's in the best cause in the world—so that on some tomorrow we can live again in freedom, peace and plenty.

Let's do it smilingly—and see that such supplies as are available go where they'll do the most good *right now*. Remember the Hoosier farm hand who was so impressed by rain after a long drought that he started to dance in the barnyard.

"Hey, you!" yelled the farmer, "Come in out of that rain!"

"Oh, I don't mind it a bit," called back the farm hand.

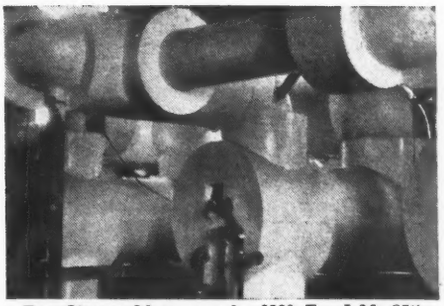
"Who cares what you don't mind," insisted the farmer, "I want every drop of that water to fall on Indiana!"

George Edwards

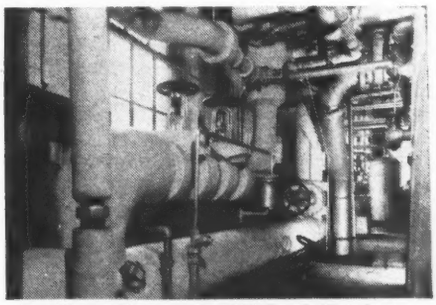
Engineer

For lasting efficiency and maximum fuel savings

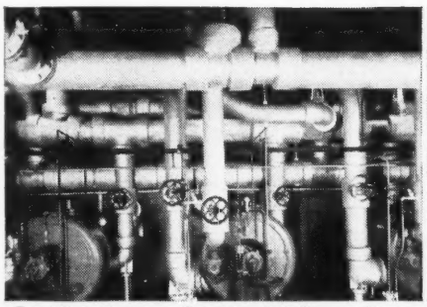
Johns-Manville Insulations



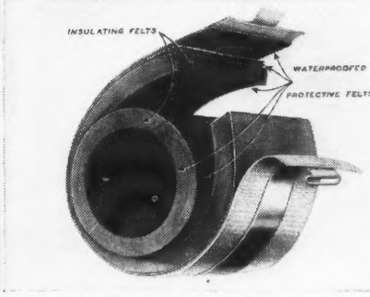
For Steam Lines up to 600° F.—J-M 85% Magnesia Pipe Insulation. Furnished in 3-ft. sections or segments in the following thicknesses: Standard, 1½", 2", 2½", Double Standard and 3" (double layer).



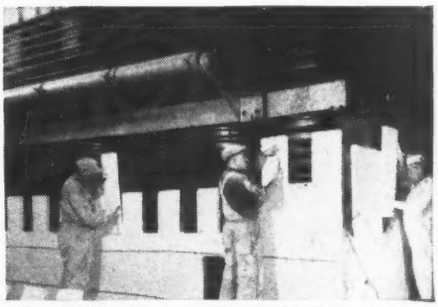
For Steam Lines up to 700° F.—J-M Asbesto-Sponge Felted Pipe Insulation provides high salvage and resistance to abuse. Furnished in 3-ft. sections in thicknesses from 1" to 3", for standard pipe sizes.



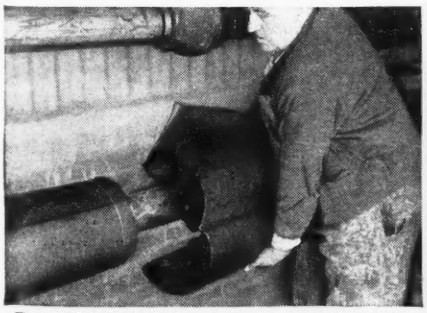
For High-Pressure Superheated Steam Lines—Superex Combination Pipe Insulation. Inner layer of Superex High Temperature Insulation with outer layer of J-M 85% Magnesia. Has unusual heat resistance; high efficiency.



For Cold Water Lines—J-M Anti-Sweat Pipe Insulation. Designed to prevent condensation. In 3-ft. sections; thicknesses, ½" and ¾", solid construction; 1", 1½" and 2", broken joint construction.

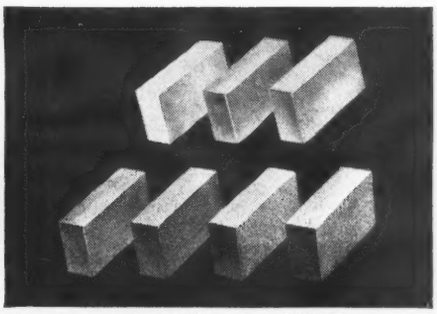


For Boiler Drums, Water Walls, Tanks, Breechings—J-M 85% Magnesia Blocks, highly efficient at temperatures up to 600° F. Sizes 3" x 18", 6" x 36", 12" x 36", flat or curved. Thicknesses 1" to 4".



For Refrigerated Service—J-M Rock Cork. Basically mineral. Can't rot, won't support vermin or mold. In sheets, 18" x 36", 1" to 4" thicknesses. Pipe covering in 3-ft. sections with integral waterproof jacket.

For Furnace Insulation up to 1900° F.—J-M Superex Blocks, for years the most widely used block insulation at these temperatures. Sizes, 3" x 18", 6" x 36", 12" x 36". Thicknesses, 1" to 4", flat or curved.



For Furnace Insulation up to 2600° F. 3 types of J-M Insulating Brick, 4 types of J-M Insulating Fire Brick, are available. Furnished in all standard 9" shapes of the 2½" and 3" series, as well as in specials.

JM JOHNS-MANVILLE PRODUCTS

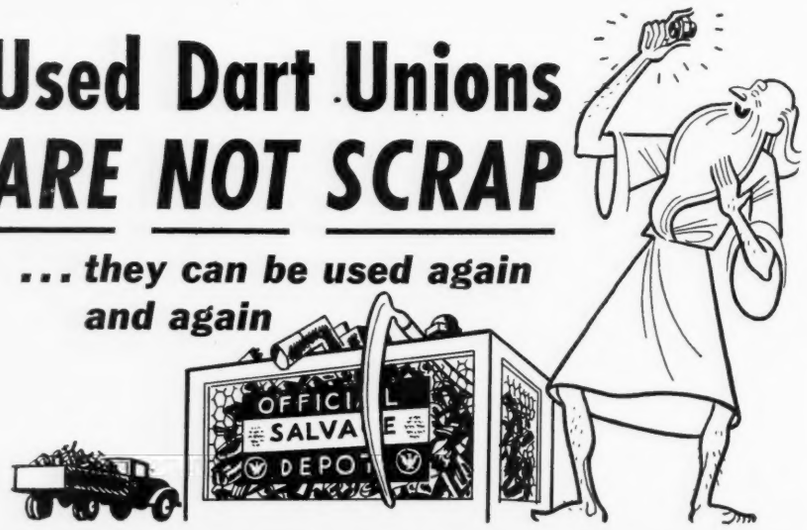
For details on these materials, and on the complete J-M Insulation line, write for catalog GI-6A. Johns-Manville, 22 East 40th Street, New York, N. Y.

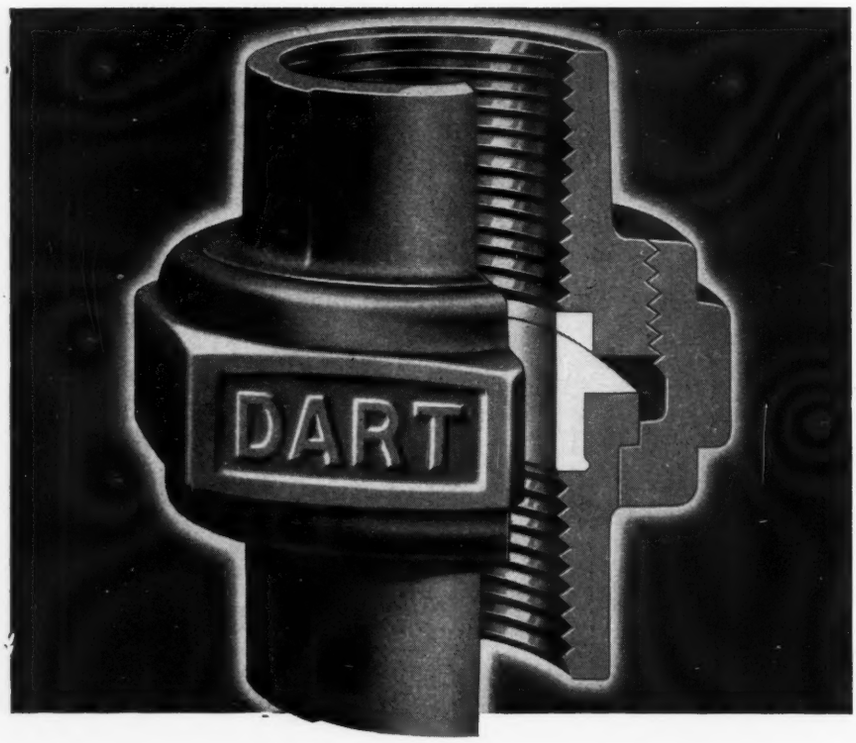
Johns-Manville INDUSTRIAL INSULATIONS

For every temperature . . . for every service

Used Dart Unions ARE NOT SCRAP

... they can be used again and again





Get in your scrap . . . *every bit.* BUT be careful not to turn in used DART UNIONS . . . because even though Darts have seen extensive service, they are capable of going back on the job with tight-joint performance.

Sounds almost too good to be true! Not when you realize that Darts have always been *made* to be used time and again . . . and to resist rough handling. Darts have matched bronze seats, ground to "true-ball" surfaces . . . and Dart bodies and nuts are made of air-refined malleable iron just so that Dart Unions *can* give you this extra service.

Try *your* used Darts . . . and if you need new ones, see your supplier today.

DART UNIONS

E. M. DART MFG. CO., Providence, R. I.

Fuels Conference

(*Continued from page* 91)

Craig described the furnace in the accompanying illustration, in which furnace bottom was lowered to the basement floor to expedite ash removal.

For reasons of economy, increased capacity and improving operation when only inferior coals were available, The Kansas City Power and Light Co in 1937 installed natural-gas burners in three chain-grate-fired boilers at its Grand Ave Station, to supplement coal firing. B L Crain, Plant Results, Engineer, described these units and further installations completed in 1941. The fishtail burners were installed just above the throat of the combustion chamber in the rear wall. Use of gas helps ignition of poor-quality coal and relieves coking troubles by reducing rate of coal burning and air temperature to stoker. Use of gas eliminated necessity of using air bypasses on the preheaters and, by improving secondary combustion conditions, boosted steam temperature. During 1941, meeting about 25% of total fuel requirements with gas produced no change in average monthly efficiency or in banking losses, reduced base-fuel costs and reduced fuel-handling costs.

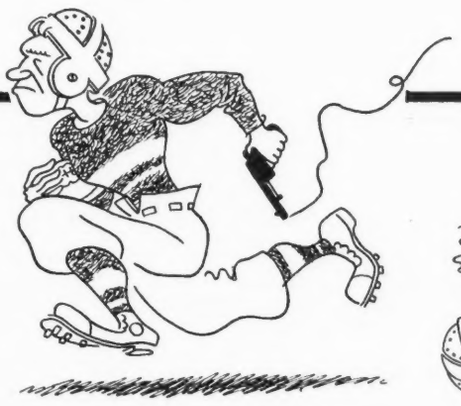
Burners at Top

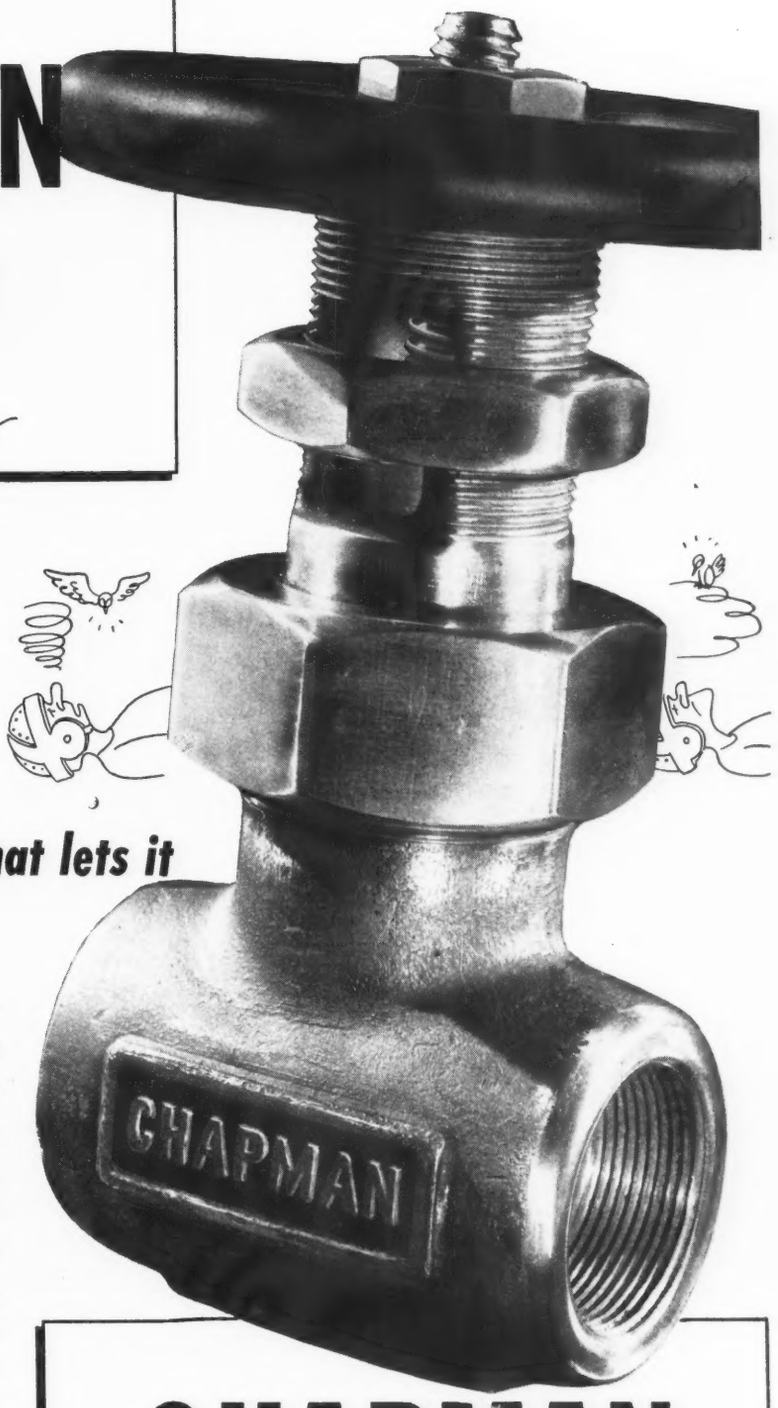
Effect of gas burning on steam temperature led to experiments with the installation of small gas burners near the top of the combustion chamber, for steam-temperature control. Twelve ½-in. burners distributed uniformly across the front of the boiler and projecting through small lancing doors were installed. With air admitted through the lancing doors, without control of air quantity, a 15-F rise was obtained when generating 150,000 lb per hr and burning 16,000 cu ft of gas per hr. The use of a controlled pre-heated-air supply should offer even greater possibilities for steam-temperature control.

Shortage of fuel oil on the East Coast has revived interest in use of colloidal fuel (pulverized coal mixed with oil in about 40–60 proportions). W C Schroeder, U S Bureau of Mines, reported on an investigation of past experience with such fuel, which indicates that stable mixture can be obtained by use of metal soaps, fatty acids or coal tar, or, as a possibly more practical solution, by finer grinding of the coal.

After discussing in some detail the work already done in preparation of coal for such mixtures and in the development of stabilizers, Dr Schroeder

CHAPMAN
List 960





Packs Extra Protection that lets it Outrun Wear

This forged-steel, small gate valve is *loaded* with tough stuff that you won't find in any similar type of valve. Plugs and seats are stainless . . . *and in addition,* they can be superhardened by a new, exclusive Chapman process that keeps them on the active list far longer than the law of wear has ever allowed before. And that makes List 960 the top small valve for wartime operation, when replacements must be held to an all-time low. You can get it in sizes from ¼" to 2", with either inside or outside rising stem . . . so better get it now, and get all small-valve troubles off your mind for the duration.

The CHAPMAN VALVE MANUFACTURING CO.
Indian Orchard, Mass.

CHAPMAN
LIST 960
the Only Small Steel Gate Valve with Superhardened Plugs & Seats

ARMSTRONG Steam Type Humidifiers have brought about a new conception of industrial humidification. They are installed and used as simply as unit heaters—connected into existing steam supply lines. They are low in cost—small models capable of handling 40,000 cu. ft. of space or more list for only $100 complete with sensitive Friez humidstat and all accessories.

They give results that end your dry air problems permanently. It may pay you rich dividends to investigate the possibilities for application of Armstrong Humidification in your plant. A request for information does not obligate you.

ARMSTRONG MACHINE WORKS, 812 Maple St., Three Rivers, Mich.

WHO USES IT:

A few of the hundreds of leading plants enjoying the benefits of Armstrong Humidification:

U. S. RUBBER CO.
PETER CARTRIDGE DIV., REMINGTON ARMS
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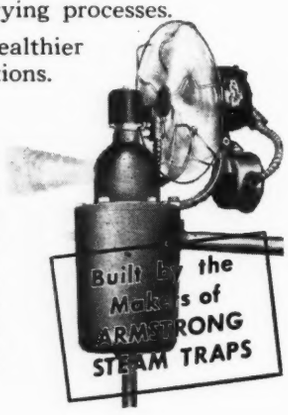
and many others!

What It Will Do For You:

1. PREVENT loss of weight, strength or quality of hygroscopic materials.
2. IMPROVE workability of materials.
3. CONTROL troublesome or dangerous dust and static conditions.
4. CONTROL drying processes.
5. PROVIDE healthier working conditions.

ANSWERS to your questions on humidification will be found in the informative Armstrong Humidifier Bulletin. Advantages, applications, hookups, recommended relative humidities for various types of work — all explained. Ask for free copy.



summed up by pointing out that preparation of oil-coal fuel can be approached in three ways: (1) to make a mixture sufficiently stable so that no settling will occur under any normal condition, (2) to provide stirrers in storage and transportation equipment to mix coal back into oil, and (3) to mix oil and coal at the point of use and provide agitators on the fuel tanks to prevent settling. Difficulty in securing quickly the pulverizing equipment needed for establishment of colloidal fuel operation on any large scale represents a serious obstacle.

Ash Disposal

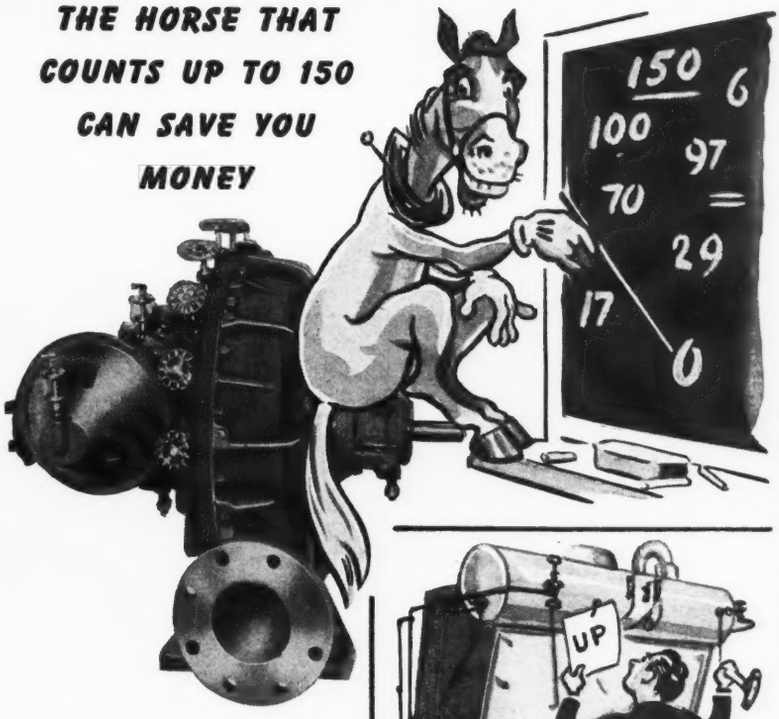
Another problem arises out of the difficulty of disposing of coal ash in a furnace designed for oil firing. Dr Schroeder recommended that a survey be made of oil-burning plants in the affected areas to determine (1) if they already have equipment necessary to burn coal, (2) if coal-burning equipment could be installed without rebuilding the furnace and boiler, (3) if an oil-coal mixture could be used without seriously reducing boiler rating or causing plugging by the ash. A further necessary step consists of actually testing oil-coal mixtures under practical conditions, to remedy the existing lack of sound test data.

Faced with the need for predicting clinkering characteristics so that coal could be suited to a customer's needs and complaints avoided, R S Weimer, Northern Illinois Coal Corp, reported on experience with clinker density as a measure of clinkering tendencies. Attempts to correlate chemical analysis of ash, and fusion temperature, with clinkering tendencies proved unsatisfactory but examination of clinker from furnaces indicated possibilities for correlation with clinker density.

Test Procedure

Experimentation led to development of a test procedure which involved burning the coal to be tested on a small domestic underfeed stoker, under standardized conditions, and determination of the apparent and true specific gravity of the resulting clinker. Comparison with results in actual furnaces, showed that "test" clinkers above 2.7 apparent specific gravity indicated tendency to form sticky clinker in an actual fuel bed, that the range from 2 to 2.5 indicated good results on most equipment, and that lower gravities indicated tendency to slow heat release and a high volume of ash. Careful application of the results of these tests permits selecting coal to suit a certain plant.

THE HORSE THAT COUNTS UP TO 150 CAN SAVE YOU MONEY



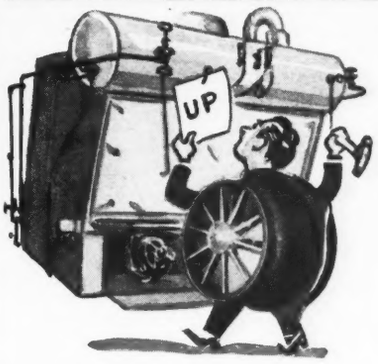
Most makes of steam turbines come in large frame sizes (100 HP and *up*), using a large frame size also for a small horsepower job. The Coppus "Blue Ribbon" line runs from 150 HP *down* — 6 frame sizes that permit you to match the turbine to the load.

You save investment cost and floor space.

And the blue band around the flange of the Coppus Turbine means you get top-notch performance — the result of precision workmanship (controlled by Johansson Size Blocks) and dynamometer-testing.

Every year, better than 85 % of the orders are *repeats!* Send for Bulletin 135-9 by checking the coupon.

COPPUS



HIGHER RATINGS WITH FANMIX GAS BURNER

You get more heat release per cubic foot of furnace volume with Coppus-Dennis Fanmix Gas Burner. So ratings of boilers, stills, kilns, etc. now operating at limit of present burners can be increased.

Fanmix puts gas under pressure to work, mechanically proportioning gas and air in a perfectly combustible mixture. The dozens of advantages that result are described in Bulletin 410-3. Check the coupon.

COPPUS

COPPUS BLUE RIBBON PRODUCTS

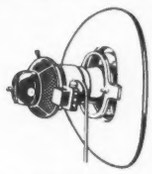
DESIGNED FOR YOUR INDUSTRY...ENGINEERED FOR YOU

COPPUS ENGINEERING CORPORATION
331 Park Avenue, Worcester, Mass.
Sales offices in THOMAS' REGISTER. Other "Blue Ribbon" Products in SWEET'S Product Reference.

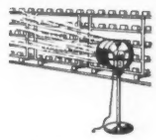
You'll get valuable ideas from these free bulletins on other Coppus Blue Ribbon Products

(Check the ones you want)

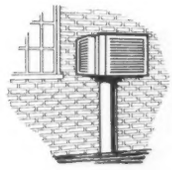
☐ Coppus • Cable Manhole and Tank Ventilators. For confined working spaces. Bulletin 163-1.



☐ Coppus Boiler Manhole Blowers and Exhausters. For cooling boilers, drums, etc. Bulletin 161-3.



☐ Coppus Heat Killers. High speed blasts for cooling and drying furnaces, motors, generators, products, etc. Bulletin 160-5.



☐ Coppus Air Filters. For engines and air compressors. Perfect, uninterrupted filtration. Bulletin F-310-4.

☐ Coppus Unit Air Filters. For industrial ventilating and air conditioning systems. Bulletin F-320-5.

☐ Coppus Steam Turbine (described in this ad).

☐ Coppus-Dennis Fanmix Gas Burner (described in this ad).

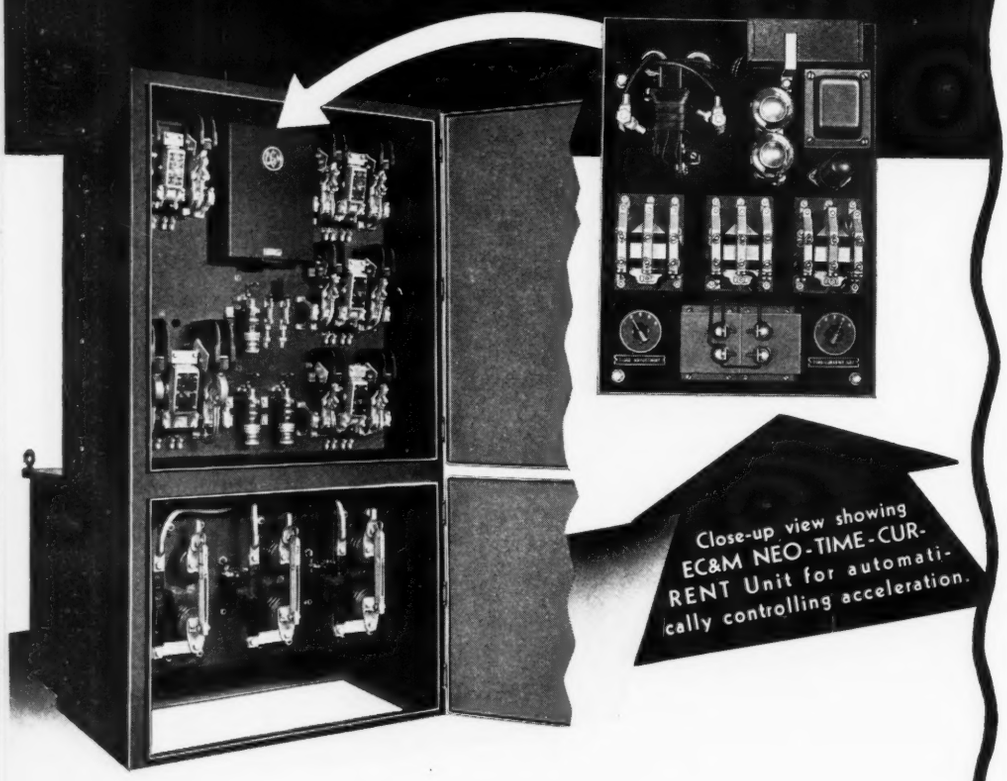
NAME.....

COMPANY.....

ADDRESS .....

Completely Assembled for QUICK Installation

EC&M 2300 VOLT WOUND-ROTOR MOTOR STARTER



Close-up view showing EC&M NEO-TIME-CURRENT Unit for automatically controlling acceleration.

HERE is a new design EC&M Push-button-operated Motor Starter for 2300 Volt Wound-rotor Motor driving a Dixie Mill Crusher. Of unit-type, it is *complete in every respect*—with self-contained disconnect switches, secondary control panel and primary magnetic contactor entirely enclosed as a single unit.

Ready to be placed in position and connections easily made to the power leads and motor terminals, this unit-assembly *offers many advantages.* It quickens installation time. The installation is shock-proof yet readily accessible, when needed, through heavy-gauge, easy-operating enclosing doors. For adverse atmospheric conditions, doors may be gasketed to exclude dust or corrosive fumes.

As a companion to EC&M Unit-type Synchronous Motor Starters, this new design wound-rotor starter makes a complete line of EC&M totally enclosed starters. Ask for Booklet 67 showing typical examples of EC&M Completely Assembled *Steel-clad* Motor Control.

THE ELECTRIC CONTROLLER & MFG. CO. CLEVELAND, OHIO

THE ELECTRIC CONTROLLER & MFG. CO.

CLEVELAND OHIO

● HEAVY DUTY MOTOR CONTROL ● BRAKES ● LIMIT STOPS ● WELD TIMERS ● LIFTING MAGNETS

Mr Weimer also reported on use of clinker-density tests to control blending of coals to produce desired characteristics and to control addition of fireclay, silica, or bauxite to increase specific gravity or lime to decrease it.

Readers' Problems

(*Continued from page* 128)

attached to the turbine steam valve prohibiting its being opened unless the light was on. Requiring the light to be on before pump should be started prevents a burned out bulb giving a dangerous indication of valve position. Valves with rising stems can be readily fitted with switches making direct contact between switch handles and valve stem. With valves having non-rising stems gear-operated position-indicator switches would be needed.

St. John, N. B. C G CLARK

Connect Suction Valve To Overspeed Device

BECAUSE WE HAVE TO DEAL with human elements in operating such equipment, it is not easy to suggest a positive remedy of GLK's predicament. I would like to recommend installing an outside screw and yoke valve in the suction line at the pump with a mechanical transmission from the valve stem to the overspeed device. A closed suction valve would keep the overspeed device tripped and the turbine out of operation; opening the suction valve would enable the operators to reset the device and then start the turbine. Installing a bypass with relief valve at the first or second stage (it is not necessary to use the last stage which would require a very expensive relief) of the pump back to the suction line would prevent damage. This would enable the operators to leave the suction valve open and the discharge valve closed, bringing the unit to normal operation without any damage to the pump.

CARL BACHMANN

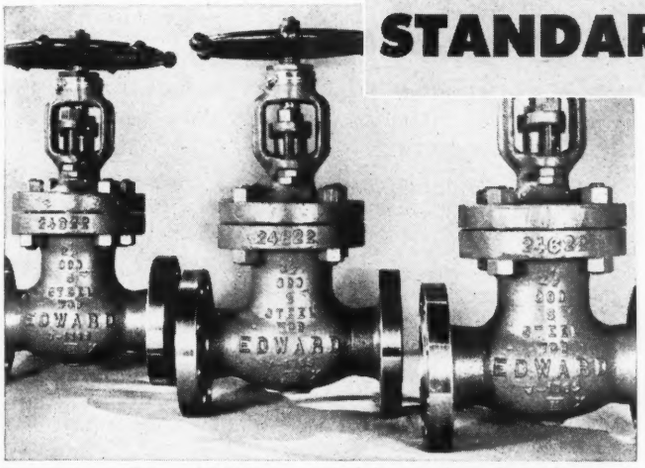
Schenectady, N. Y.

Low Suction Pressure Will Cause Cavitation

THE LIMITED DESCRIPTION is not sufficient to bring about a clear analysis of GLK's trouble with his turbine-driven boiler-feed pump. However, he states the trouble manifests itself when inlet pressure drops.

In centrifugal-pump operation many

Cut Delivery Time with These STANDARD EDWARD VALVES



It pays to use Edward 300 lb sp steel globe, angle and check valves. Note strong, functional design of 2½ in. cast steel globe stop valves above. Fully guided disk permits installation in any position.

Choosing these standard Edward valves means quicker delivery. But important as that is today, there are other big dividends—such things as maximum job and part interchangeability, easier installation and other time saving factors.

Built with the customary Edward emphasis on "plus value" construction, these versatile forged and cast steel valves fit a wide variety of power, petroleum, process piping and industrial services. For more detailed descriptions and dimensions see Edward Catalog No. 101. If you haven't a copy, a post card will bring you one by return mail.

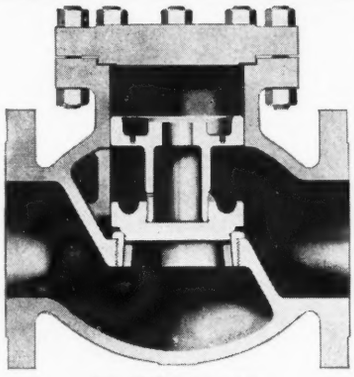


Fig. 6597—Horizontal

CAST STEEL CHECKS . .

For 300 lb check valve service, choose Edward Fig. 6597 (horizontal) or Fig. 6598 (angle). Cast steel, piston type, flanged ends, sizes 2½ in. to 12 in. Integrally cast ribs guide disk-piston assembly throughout travel. Streamlined bodies contoured for free flow. Also built for pressures to 1500 lb and in sizes to 12 in. Forged steel check valves, ¼ in. to 2 in. available.

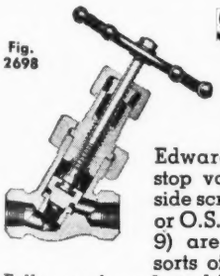


Fig. 2698

SCREWED STOP VALVES

Edward screwed end stop valves, either inside screw (Fig. 2698-9) or O.S. & Y. (Fig. 2688-9) are going into all sorts of service today. Full area forged steel bodies minimize pressure drop. EValloy seats and disks. Drop tight closure. Globe and angle, for 600 lb sp in sizes ¼ in. to 2 in.

FLANGED STOP VALVES . .

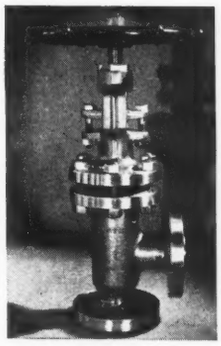
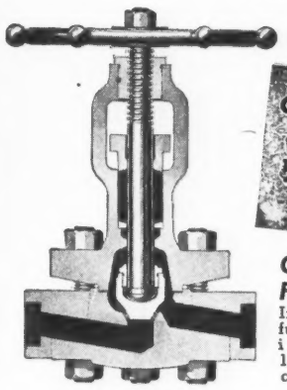
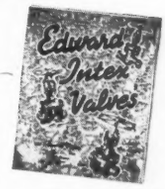


Fig. 4829

There's long, economical life in Edward globe and angle forged steel flanged end stop valves. Seats, disks and stems are EValloy, Edward's specially processed stainless steel. Unique swivel plug type disk design prevents galling. Heat treated forged steel bodies proportioned to reduce distortion under heat. O.S. & Y. with bolted bonnets and bolted glands. For pressures to 600 lb sp, sizes ½ in. to 2 in. Same design characteristics available in valves for service to 1500 lb.

INTEX GLOBE STOP VALVES . .





GET THIS FOLDER!

Intex valves are fully described in Catalog 12-G5. Write for a copy today!

Fig. 3264

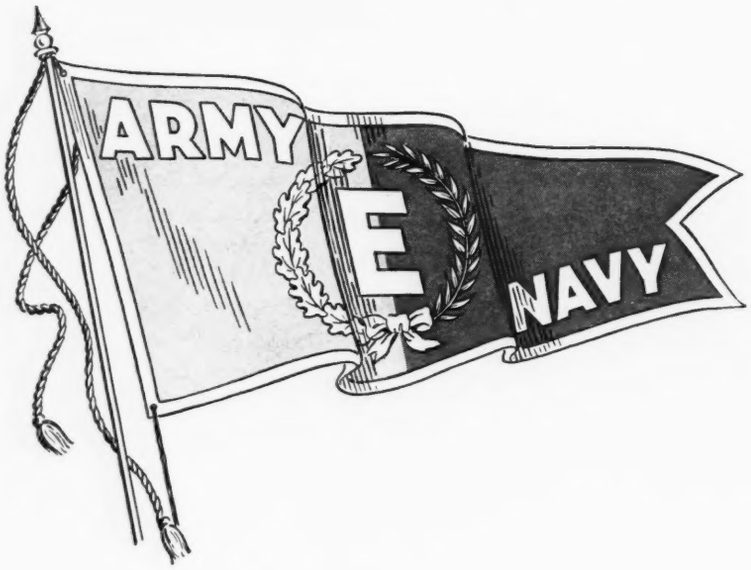
Disks and integral seats of these Edward Intex valves are hard surfaced with Stellite. Disassembly unusually easy, working parts readily accessible. Socket welding, flanged or screwed ends for pressures to 1500 lb at 950 F.

BLOW-OFF VALVES . . . .

Edward blow-off valves are designed to avoid damaging shock to piping. Simple, frill-free construction with no unnecessary parts to erode or cause clogging. EValloy and Stellite seats and disks. Globe type seating for tight closure. Straightway and angle for 150 to 1500 lb sp service.

THE EDWARD VALVE & MFG. CO., INC.
1220 W. 144th STREET • EAST CHICAGO, INDIANA

EDWARD Steel CAST AND FORGED VALVES



"—for great accomplishment in the production of war equipment."

With pardonable pride we announce the Award of the

Army-Navy "E"

September 5, 1942

BONNEY FORGE & TOOL WORKS
ALLENTOWN, PA.
Since 1876

WELDOLETS·
TRADE MARKS - REG. U. S. PAT. OFF.
THREDOLETS
Welded Outlets for Every Piping System

things should be considered; pressure differences in the pump produced by the fluid forces, the speed of rotation, and the rate of flow through the pump. The head pressure varies with the power consumption. Cavitation is a term used in pump design, and is similar to propeller slippage in marine practice.

This apparently is GLK's trouble, as cavitation occurs when the inlet pressure drops, or if the rotating speed increases because of a drop in the inlet pressure. I would suggest that the turbine-governing mechanism be reset to act at a lower rate of speed.

A possibility again exists that the speed of rotation is too great for efficient operation of the pump, and therefore a slowing down of the turbine speed is recommended. This slowing up of the rotating speed is preferable to throttling down the pump discharge, which ruins the valves in a short time.

Grand Rapids, Mich. J M GORRIE

Argument Corner

(*Continued from page* 130)

the safe operation of equipment.

The Department of Public Safety of the Commonwealth of Massachusetts stood almost alone for years in recommending fusible plugs for compressed air tanks. A fusible plug was required in the highest part of every primary air tank and also close to the compressor in the discharge line. This requirement was removed from their rules about five years ago and they are now silent on the question of fusible plugs for air tanks.

I understand that at present air tank fusible plugs are required in several Canadian provinces and by city inspection departments in a few widely scattered localities.

I do not share the opinion that the fusing temperature was over a wide range, as the specifications for pure tin were quite closely followed by the few manufacturers of Massachusetts Standard air tank fusible plugs. One of the largest manufacturers, however, stopped production of these units following the ruling that they were no longer required in Massachusetts. Insofar as safety goes, I would recommend a fusible plug only in a system that for some reason or other operates at rather high temperatures, and if there is likelihood of loss of cooling water. However, conditions in these days of priorities and shortages mean little considering the fact that a fusible plug is made of brass and pure

Marks the Spot
Those dots mark the spot . . . the *fire safety zones* in hundreds of cities, towns and hamlets throughout the United States. They mark the spots where Darling Fire Hydrants have been installed—hydrants that for more than 40 years have been delivering water supply under *full pressure,* the instant that it's needed.
Today more than ever before, adequate fire protection is demanded for the protection of American industries, business districts and homes. Darling Fire Hydrants are meeting those demands now and will continue to do so for many years to come. It's the hydrant that is built *up* to *perfection,* not *down* to price.
Get These Facts on Darling Fire Hydrants
Because they are so valuable—so economical to operate—so easy to repair—there is available to you an accumulation of facts and figures that clearly indicate the lower maintenance costs of Darling Fire Hydrants over a long period of years. This information is based upon the actual experiences of municipalities and industries using Darling Fire Hydrants. Wire or write for complete information. Darling Valve & Manufacturing Company, Williamsport, Pa.
Protection
Every Hour
Every Day
TRADE
DARLING
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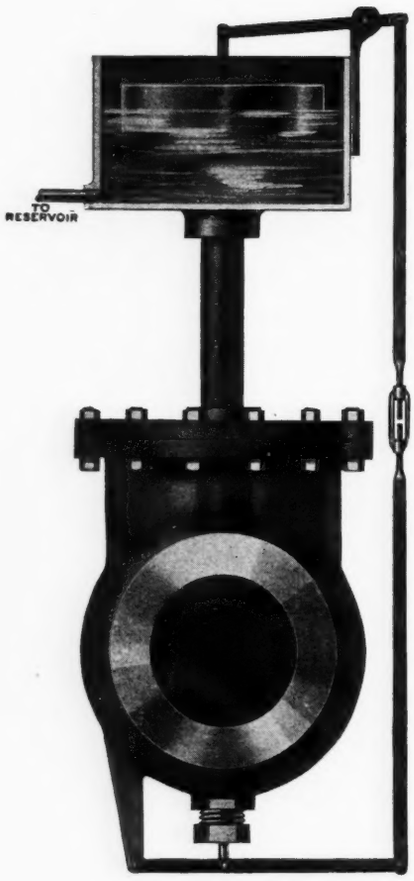
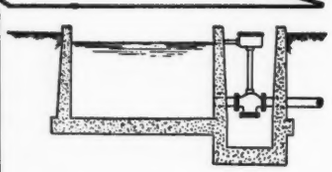
VALVE & MANUFACTURING CO.
WILLIAMSPORT, PA.

GOLDEN-ANDERSON specialty VALVES





FLOAT CONTROL

● Especially practical and desirable for water level control in mixing chambers, coagulating basins, etc., is the G-A Balanced Controlling Float Valve. It *insures* a maximum water level and a constant rate of flow. In the closed position, this valve will seat absolutely tight, and it is cushioned to overcome any shock or surge. Provided in 3" to 24" sizes, this G-A all-around efficiency valve has flanged ends with iron body and bonnet and bronze trim. Complete and detailed information on the entire G-A line may be had upon request. Write for our latest free catalogs today.

also ***Altitude Control . . . Pressure Reducing . . . Throttle and Emergency Stop . . . Check Valves etc.***

GOLDEN-ANDERSON VALVE SPECIALTY CO.
Fulton Building · · · Pittsburgh, Pa.

tin. In fact, they cannot even be purchased for steam boilers in wide areas at this time.

One recent development is the Tempilstick to check on suspected high temperatures. The sticks are built for different temperatures but the one we use is rated at 300 F. The stick is rubbed across an air tank or compressor discharge pipe. If the temperature is over 300 deg, the stick makes a liquid smear; if it is below that range, it leaves a dry chalky mark.

As for oil traps, it is true that difficulty is not uncommon. Practice in a number of large installations is to provide condensate and oil receivers beneath the aftercooler and the air tank.

Canton, Mass. H M SPRING

New Power Construction

Construction to Come

Arizona—U. S. Eng. 751 S Figueroa St, Los Angeles, plans constructing imprvs. Over $3,000,000.

Arkansas—U. S. Eng, Gay Bldg, Little Rock, plans constructing laundry bldg, steam plant, to Petersen & McFayden, Commercial Natl Bank Bldg, Little Rock.

California—Bids by Bureau Reclamation, S. O. Harper, ch engr, Denver, Colo., furnishing del 270 ton transformer-transfer car for Keswick power plant. Kennett Div, Central Valley Project. Spec 1669-D.

California—Bids by Bureau Reclamation, Denver, Colo., furnishing four 30-in. sphere valves, with controls metalwork for station-service penstocks. Shasta Power Plants, Kennett Div, Central Valley Project, Spec 1049. J C Page, comr.

California—U. S. Eng, 751 S Figueroa St, Los Angeles, plant constructing imprvs. Over $5,000,000.

Illinois—War Dept, 20 St and Constitution Ave N W, Wash., D. C., plans constructing 34.5 kilovolt electric substation and 3.5 mi interconnecting transmission lines. $99,179.

Ind., Terre Haute—Pub Service of Indiana Traction, Terminal Bldg, Indianapolis, soon lets contract constructing brick superstructure power plant, Unit 5, Sargent & Lundy, 140 S. Dearborn St, engrs.

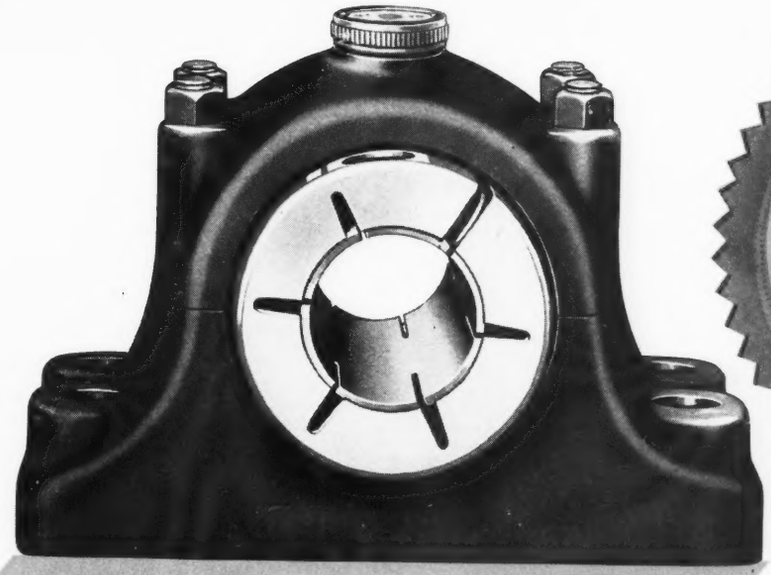
Kansas—U. S. Eng, 10 E 17 St, Kansas City, Mo., plans constructing mfg plant. Over $5,000,000.

Kansas—U. S. Eng, 601 Davidson Bldg, Kansas City, Mo., plans constructing plant enlargement. $5,000,000.

Ohio—U. S. Eng, Wright Field, Dayton, plans by A M Kinney, Enquirer Bldg, Cincinnati, constructing addn central heating plant and heating tunnel, Montgomery Co. $500,000.

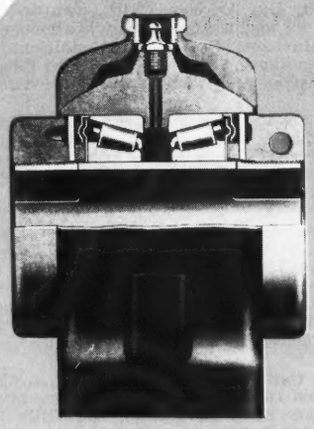
Pennsylvania—Yards & Docks, Navy Dept, 18 St, and Constitution Ave N W, plans nearing completion for mill expan. Industrial company will operate.

Texas—American Republics Petroleum



Dodge-Timken D-T Clamp Sleeve Type Pillow Block.

Keep power flowing for Victory production; assure economy for post-war competition. Use Timken Bearing Equipped transmission units.



Section of Dodge-Timken D-T Clamp Sleeve Type Pillow Block showing the application of Timken Bearings.

Obsolete, friction-ridden pillow blocks and line shaft hangers are responsible for many involuntary power interruptions and consequent production shutdowns.

They are difficult to keep lubricated properly, are subject to burning out and reduce shaft life through wear. Furthermore, a considerable percentage of the power transmitted through them is lost enroute —burned up by friction.

All these disadvantages are permanently overcome when modern Timken Bearing Equipped units are used. There is no friction to waste power; lubrication is needed only at long intervals, for once put in, the lubricant *stays* in; the same effective bearing closures *keep dirt out.* And because all movement takes place within the bearings themselves, there is no wear whatsoever on shafts.

Loads of all types—radial, thrust or both together —are adequately taken care of by the geometrical design of the Timken Bearing and its precise, sturdy construction.

Check up on your power transmission equipment now and replace the undependable power wasters with modern dependable power savers.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

Manufacturers of Timken Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; Timken Alloy Steels and Carbon and Alloy Seamless Tubing; and Timken Rock Bits.

HELP ASSURE VICTORY

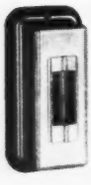
Buy War Bonds. Conserve Rubber. Eliminate Unnecessary Travel. Use the Telephone Only When Important. Salvage All Scrap and Waste Material.

VITAL WARTIME PRODUCTION *Benefits By* JOHNSON *Experience*

Today– it's two jobs with one objective

For more than half a century, the name "Johnson Service" has spelled "automatic temperature control" in the heating and air conditioning industries. But, today, the skill and experience of the Johnson organization is devoted also to the complete production of vital aircraft instruments and accessories for those who "Keep 'Em Flying". Additional facilities in the Johnson factory are working at top capacity, too, machining and assembling parts that go into ships and bombs and other tools of war. That is the added job which Johnson has assumed in the march to American Victory.

Our only wish is that we may be privileged to accomplish even more in the fight that has just one objective—decisive triumph for the armed forces of America and the United Nations, and life everlasting for the principles of American democracy. That is our up-to-date conception of the ultimate in *Johnson Service*.



★ ★ ★ WAR PLANTS GUARDED BY JOHNSON CONTROL ★ ★ ★

In war production plants, Johnson equipment automatically regulates temperatures and humidities in work spaces, test rooms, and processing chambers. Aircraft parts are machined and assembled, powder is manufactured, and shells are loaded in buildings where heating, processing, and air conditioning apparatus is "watched", accurately and efficiently, by Johnson control systems. On the ships of war, too, Johnson control sails the seven seas.

That is the second of the two jobs which the nation-wide Johnson organization accomplishes—solving war industry's temperature and humidity control problems.

JOHNSON

Automatic TEMPERATURE AND AIR CONDITIONING *Control*

JOHNSON SERVICE COMPANY, MILWAUKEE, WIS. & BRANCHES IN PRINCIPAL CITIES

Co, Petroleum Bldg, Houston, plans constructing new unit, remodeling existing plant. $1,500,000. Federally financed.

Texas—Dow Chemical Co, Midland, Mich., plans constructing plant. $11,000,000. Defense Plant Corp will finance.

Texas—Bids by U. S. Eng, Citizens Natl Bank Bldg, Denison, constructing powerhouse, for Denison Dam and reservoir, Red River, Grayson Co. Plans deposit $25.

Wash., Tacoma—Bids by City, City Hall, constructing 13.8 kv bus and equip for La Grande powerhouse, part of second Nisqually power development.

Wash., Vancouver—Bonneville Auth, P O Box 3537, Portland, Ore., plans constructing substation expansion, new transformer banks, condensers, exten 115,000 and 230,000 volt buses and new steel tower line. $1,200,000.

Contracts Let

Arizona—U. S. Eng. 751 S Figueroa St, Los Angeles, Calif., awarded contract for insulating, heating, air-conditioning, Maricopa Co, to Air Conditioning Co of Southern Calif, 1003 S Sante Fe Ave, Los Angeles, under $50,000.

Ark., Norfolk—U S. Eng, Gay Bldg, Little Rock, awarded contract furnishing 3 kva transformers at Norfolk Dam power plant, to Moloney Electric Co, 5390 Bircher St, St. Louis, Mo.

Ark., Norfolk—U. S. Eng, Gay Bldg, Little Rock, awarded contract constructing outside housing for power installation, to Utah Const Co, 1 Montgomery St, San Francisco, and Morrison Knudsen Co, 300 Bway, Boise, Idaho. Est over $1,000,000.

California—Industrial company awarded contract constructing imprvs, prefabrication steel substation, to Willis F Lynn, 1037 Ashmount Ave, Oakland; frame timber mock-up roof, to Midstate Constr Co, 251 Kearny St, San Francisco.

California—U. S. Eng, 751 S Figueroa St, Los Angeles, awarded contract constructing steam distr sys and fuel oil storage facilities. San Bernardino Co, to K Fraser, 1452 N Lake Ave, Pasadena, $500,000-$1,000,000.

California—U. S. Eng., 1209 8 St, Sacramento, awarded contract constructing boilers, Lassen Co, to Beeson Bros Supply Co, 1000 W Alhambra Ave, Los Angeles Est under $50,000.

California—U. S. Eng, 74 New Montgomery St, San Francisco, awarded contract constructing electrical work for cold-storage facilities, to Weber & Conroy, 3211 Mission St, San Francisco.

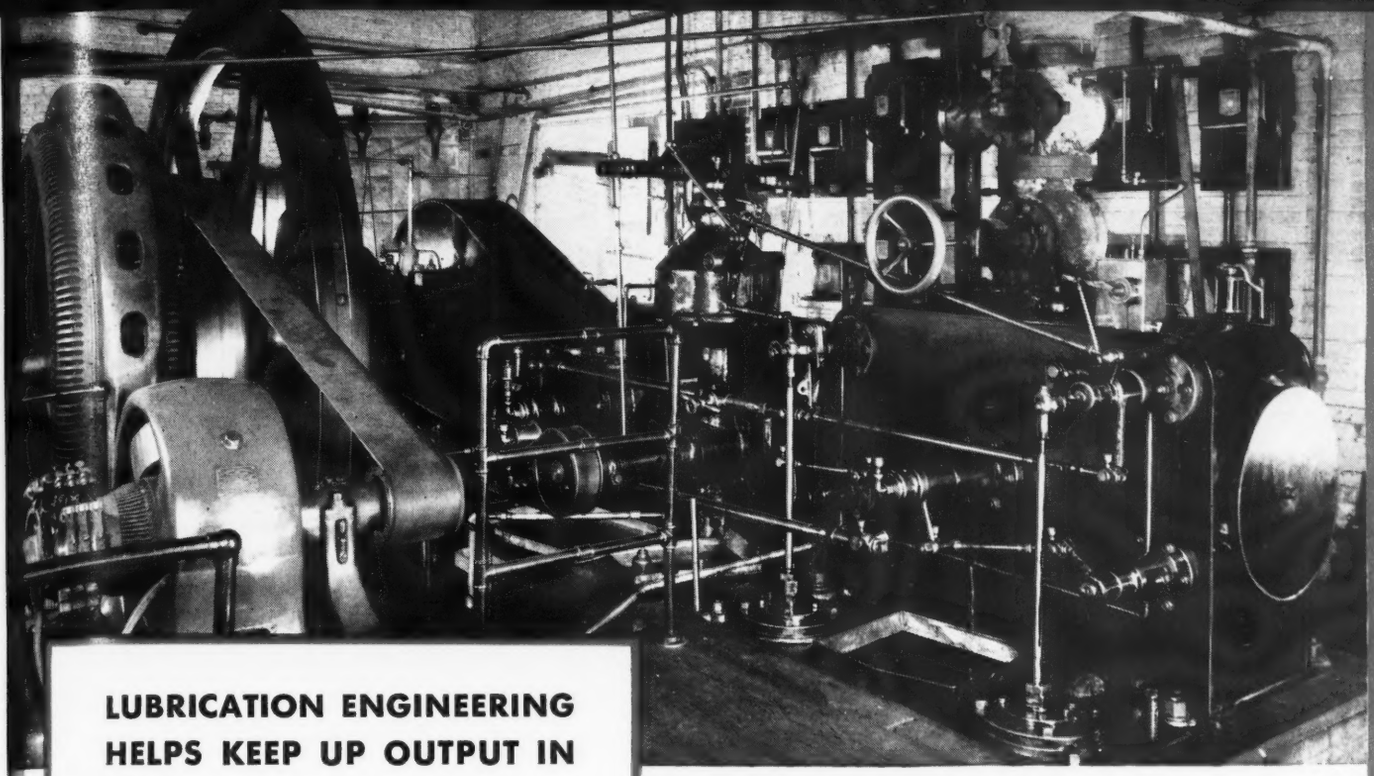
Calif., Maryville—National Ice & Cold Storage Co, Marysville, awarded contract constructing cold-storage plant, to W R Burroughs, 911 5 St.

Colorado—U. S. Eng, c/o Postmaster, Denver, awarded contract constructing air conditioning unit, Pueblo Co, to V V McChesney, Denver, under $50,000.

Florida—U. S. Eng. Courthouse & Postoffice, Jacksonville, awarded contract constructing central steam dist sys, Dade Co, to Cleary Bros Constr Co, West Palm Beach, under $50,000.

Florida—U. S. Eng, Courthouse & Postoffice, Jacksonville, awarded contract constructing air-conditioning sys, Jackson Co, to C W Hughes, Inc, 307 Park St, Jacksonville, under $50,000.

Florida—U. S Eng. Courthouse & Postoffice, Jacksonville, awarded contract constructing air-conditioning sys, Highlands



LUBRICATION ENGINEERING HELPS KEEP UP OUTPUT IN THESE TYPICAL PLANTS

PROBLEM—Excessive valve wear developed on the Corliss engine pictured above in a Wisconsin manufacturing plant. The engine would not pull its normal load—steam consumption was so high it was necessary to shut down to build up steam pressures.

SERVICE—Indicator cards were taken by the Standard Oil Engineer. Valves were set, new piston rings installed, and the engine started on Stanocyl Steam Cylinder Oil.

RESULT—The engine now operates satisfactorily on all loads—steam pressure is adequate and no time is lost in shutdowns. This, plus a 30% reduction in lubricating costs.

• • •

PROBLEM—To double flour production, a central states mill had to increase capacity of the Corliss engine. Boiler pressures were raised from 140 lbs. to 180 lbs. Engine speed was increased from 80 RPM to 120 RPM. Because of increased pressures and speed, frequent inspections were made. These soon revealed a marked increase in piston and ring wear. Oil carryover became a serious problem.

SERVICE—A Standard Lubrication Engineer analyzed operating conditions. A force feed lubricator and atomizer were installed. The engine was started on a high grade Standard cylinder oil, and feed adjusted to one pint of oil per million sq. ft. of rubbing surface.

RESULT—The reduced feed helped eliminate oil carryover—effecting a worthwhile saving in boiler cleaning labor and promoting safer boiler operation. Frequent inspections showed ring wear was reduced 75%—indicating adequate lubrication. Most important, the Engineer's recommendations answered this operator's question on how to avoid shutdowns and excessive maintenance.

OIL IS AMMUNITION . . . USE IT WISELY

AVOID SHUTDOWNS ON OVERWORKED STEAM ENGINES

• Are power demands pushing your generating equipment to the limit? If so, there are a number of questions which you'd like answered. How long will your equipment stand the added strain? How soon will shutdowns for maintenance seriously cut into power output? What can you do to avoid excessive repairs?

Standard Lubrication Engineers haven't all the answers, but they have helped many plants meet war-time loads. Examples of this service are briefly described at the left. See if they suggest ways one of these Engineers can help you. Then write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago, Illinois, for the Engineer nearest you. In Nebraska, write Standard Oil Company of Nebraska at Omaha.

STANDARD OIL
STEAM CYLINDER OILS

STANDARD OIL COMPANY (INDIANA)

LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . . LUBRICATION ENG

NG...LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRICAT

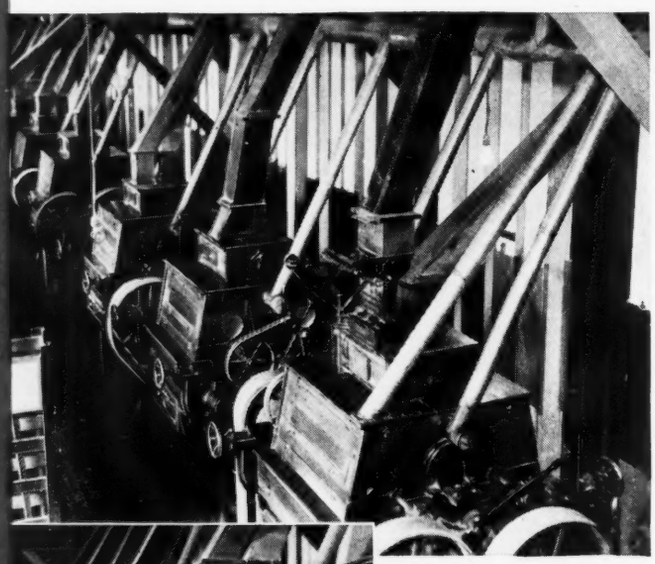
NOT A BEARING FAILURE IN TWO YEARS...LESS TIME FOR OILING WITH STANODRIP

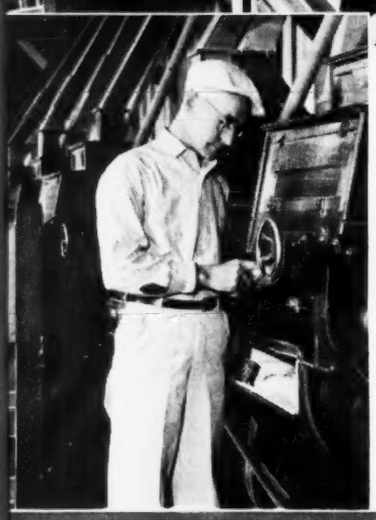
How can you save valuable production time and labor? Here's one answer. J. O. Schneider, Superintendent of the Cannon Valley Milling Company at Cannon Falls, Minn., briefly describes the results he got when he changed from a conventional engine oil to Stanodrip, a dripless oil.

He writes, "Since using your Stanodrip for the past two years we have not had a bearing failure or any trouble with bearings heating. This resulted in a considerable saving in production time."

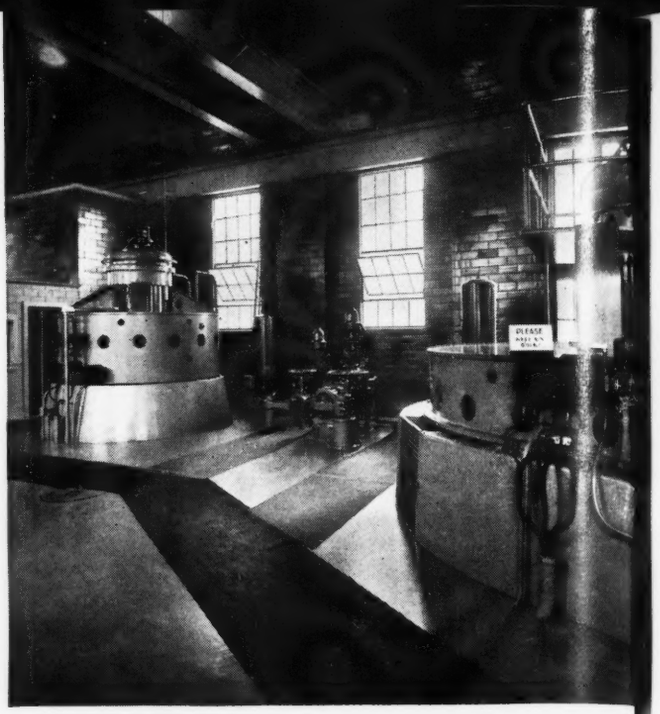
On the saving in labor he says, "The cost of *oil application* has been reduced to one-third of what it was before using Stanodrip. Also, we're not having any trouble with oil on the machines and floor, *another saving in labor.* This oil costs more *per gallon,* but descreased consumption has made a 20% *net saving* on oil."

See if better lubrication and lubricants won't save much needed time and labor for you. A Standard Lubrication Engineer will help you find the spots.





(Left) J. O. Schneider, Supt. of Cannon Valley Milling Co., Cannon Falls, Minn., credits his change to Stanodrip lubrication with the complete elimination of bearing failures, a saving of two-thirds in oiler time, and 20% in oil costs, on the mills shown above.



STANOIL HAS LASTED 3 TIMES AS LONG AND STILL DOESN'T NEED TO BE CHANGED

When a conventional oil was used on the hydro-turbines pictured above, it had to be changed at least every six months. On one turbine the oil oxidized and turned dark in 10 days. That was the last fill of that oil.

When a Standard Lubrication Engineer was called in, he recommended Stanoil, which proved to be a wise choice. The same fill of Stanoil has now been in these turbines for a year and a half. There is no indication that it will need replacing for some time to come.

You'll find the same results with Stanoil in gear cases, circulating systems, and oil-lubricated bearings. Its high stability cuts shutdown time and maintenance by reducing oil replacement and oil system cleaning.

HERE'S WHERE YOU'LL FIND A STANDARD OIL ENGINEER

If you are located in one of the middle western states listed below, let a Standard Lubrication Engineer see if he can't help you save valuable production time, maintenance, labor or equipment by recommending better lubricants or better lubricating methods. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago, Illinois, for the Engineer nearest you. In Nebraska, write Standard Oil Company of Nebraska at Omaha.

COLORADO • ILLINOIS • INDIANA • IOWA • KANSAS • MICHIGAN
MINNESOTA • MISSOURI • MONTANA • NORTH DAKOTA • WYOMING
SOUTH DAKOTA • WISCONSIN

OIL IS AMMUNITION . . . USE IT WISELY

STANDARD OIL COMPANY (INDIAN

Looking ahead with Asbestos

The significant wartime fact about K&M "Century" Flat and Corrugated Asbestos Lumber is that over 25,000,000 sq. ft. of it have already been supplied to vital war industries.

Arsenals, powder plants and factories have been quick to employ an industrial building material whose speed of erection is only rivaled by its freedom from time-and-money-wasting maintenance. For it requires no protective treatment for preservation from the attacks of rot, rust or weather.

K&M Asbestos Lumber, in flat and corrugated form, is formed into sheets by subjecting asbestos fibre and Portland cement to tremendous hydraulic pressure. In combination these two indestructible elements not only toughen with age but are also highly resistant to fire.

The demands of war have for the present limited the general availability of this remarkable material for non-essential building. But, with the coming of peace, it will resume full peace-time employment in all types of industrial construction; along with new products that K&M's continuing research into asbestos promises to develop.

* * *

Nature made asbestos;
Keasbey & Mattison, America's asbestos pioneer, has made it serve mankind . . . since 1873.

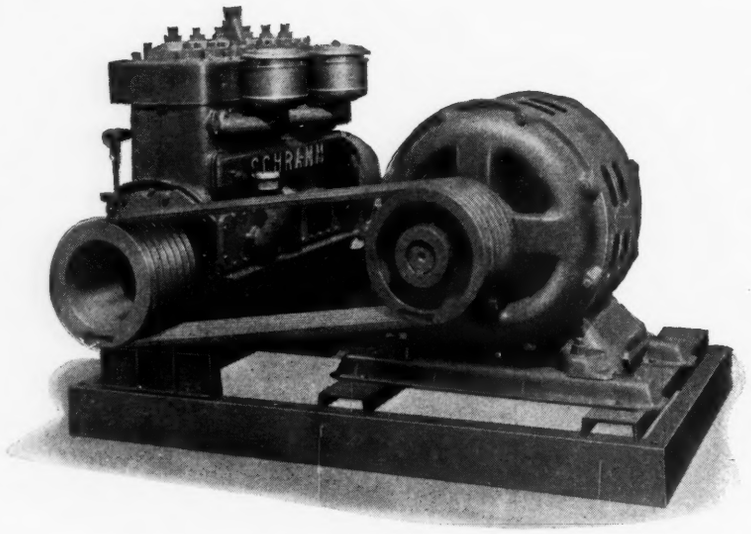
KEASBEY & MATTISON

COMPANY, AMBLER, PENNSYLVANIA

Makers of

asbestos-cement shingles and wallboards; asbestos and magnesia insulations for pipes, boilers, furnaces; asbestos textiles; asbestos electrical materials; asbestos paper and millboard; asbestos marine insulations; asbestos acoustical material; asbestos packings; asbestos corrugated sheathing and flat lumbers; asbestos-cement pipe for water mains

A-1-A
PRIORITY ON PERFORMANCE



"V" Belt Drive On Base With Motor

• Throughout the many years of SCHRAMM operation they have been tops in performance; so now when economical, dependable and speedy performance is necessary in the present Victory drive, SCHRAMM is prepared to answer the call.

SCHRAMM Compressors are designed for heavy-duty, continuous service and will perform such service with least up-keep and operating costs. They are available for flat belt or complete "V" belt drive, "built-in" motor drive with compressor and motor assembled rigidly and in perfect alignment. Units are light, compact and easy to handle, reducing headroom and floor space requirements.

BUILT IN SIZES
from 50 to 600
Cu. Ft. Displacement

WRITE FOR CATALOG 42-S

SCHRAMM INC., WEST CHESTER, PA.

SCHRAMM *Air Compressors*

Co, to W G Haggerty, Inc, 805 Morgan St, Tampa, under $50,000.

Georgia—U. S. Eng, 494 Spring St, N W, Atlanta, awarded contract constructing heating and ventilating sys, Cobb Co. to Kerby Saunders, Inc, 330 W 42 St, New York, N. Y., $1,000,000-$5,000,000.

Georgia—U. S. Eng, Courthouse & Postoffice, Jacksonville, Fla., awarded contract installing air conditioning sys, Lowndes Co, to Charles W Hughes, Inc, 307 Park St, Jacksonville, Fla., under $50,000.

Illinois—U. S. Eng, U. S. Courthouse & Customhouse, St. Louis, Mo., awarded contract constructing air conditioning for bldg, Sangamon Co, to York Ice Mchy Corp, 117 S 11 St, St. Louis, Mo., under $50,000.

Indiana—U. S. Eng, 700 Union Guardian Bldg., Detroit, Mich., awarded contract constructing boiler house addn, Allen Co, to Hipskind Plumbing & Heating Co, 1725 Winter St, Fort Wayne, less than $1,000,000.

Louisiana—U. S. Eng, foot of Prytania St, New Orleans, awarded contract constructing summer and winter air conditioning sys, Inv 43-82, to D Doherty-Sterling, Inc, 3150 Florida St, Baton Rouge.

Louisiana—U. S. Eng, foot of Prytania St, New Orleans, awarded contract constructing cold-storage facilities, to Le Blane Bros & Aldrich, La. Natl. Bank Bldg, Baton Rouge.

Maryland—U. S. Eng, Aberdeen, awarded contract constructing cold storage bldg, to John K Ruff Co, 100 W 22 St, Baltimore.

Massachusetts—U. S. Eng, Park Square Bldg, Boston, awarded contract constructing cold storage bldg addn, Barnstable Co, to Sullivan-Foster, Inc, New Bedford, under $50,000.

Massachusetts—U. S. Eng, Park Square Bldg, Boston, awarded contract for air conditioning sys, Inv 175-43-Neg 47, to Boston Filter Co, Inc, 43 Harvard Square, Charlestown. Est under $50,000.

Michigan—U. S. Eng, 700 Union Guardian Bldg, Detroit, awarded contract constructing boiler house, Macomb Co, to M A Clausen, 15529 Woodrow Wilson Bldg, Detroit, under $1,000,000.

Michigan—U. S. Eng, 700 Union Guardian Bldg, Detroit, awarded contract constructing steam dist sys, installing heating sys, Chippewa Co, to E Korkoske, Gladwin, under $1,000,000.

Michigan—U. S. Eng, 700 Union Guardian Bldg, Detroit, awarded contract constructing electric dist sys, Chippewa Co, to R C Martin Co, 6532 Hamilton St, Detroit, under $1,000,000.

Mich., Detroit—Federal Mogul Corp, 11031 Shoemaker Ave, awarded contract constructing 1 story, machine shop. Power house to W J C Kaufmann Co, 10610 Shoemaker Ave; electrical contract to Fife-Pearce Electrical Co, 1446 Gratiot Ave. Est approx, $350,000.

Neb., Omaha—Jerpe Commission Co, 12 and Douglas Sts, awarded contract constructing cold-storage plant, to John Lof & Sons, 4012 Lake St. Est $100,000.

Nevada—U. S. Eng, 751 S Figueroa St, Los Angeles, Calif., awarded contract for air conditioning, heating and dust-proofing, Inv 244, to W C Bradshaw, 912 Echo Ave, Fresno, under $50,000.

New Jersey—U. S. Eng, 120 Wall St, New York, N. Y., awarded contract constructing water, electric, gas and sewerage sys, Middlesex Co, to Chas F Vachris, Inc, 827 Remsen Ave, Brooklyn, N. Y. $1,000,000-$5,000,000.

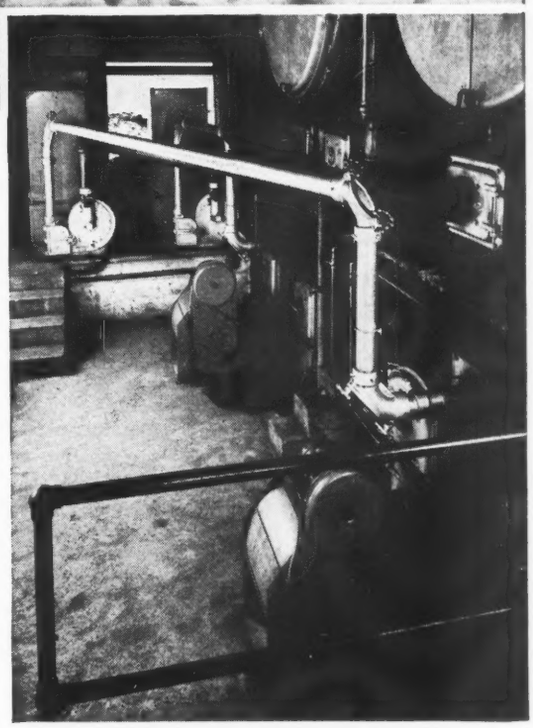
WACO Doubles Steam Output with Iron Fireman P-S* Stokers

*Pneumatic Spreader Stokers "standard" at Waco Aircraft Plants

PLANES and more planes will win the war . . . and Iron Fireman is supplying more steam for building these planes at Waco. Waco is expanding tremendously to build more training and cargo aircraft. Right now at Waco, a large addition is under construction. Because of Iron Fireman's proved performance, the company *specified* Iron Fireman Pneumatic Spreader stokers to do this new firing job.

Last year in its central plant, Waco installed Iron Fireman P. S. stokers to replace another type of automatic firing equipment which could not carry the steam load for heating and processing. Iron Fireman engineers recommended that two P. S. No. 12 stokers be installed in the existing 195 h.p. boilers. At that same time the plant's capacity was *expanded,* and the company was amazed to find that with P. S. firing *one* boiler could carry the greatly increased load even with weather 15° below. (The smaller original load had been too much for two boilers with the former firing equipment). Also, fuel costs remained the same, although the load is much heavier.

S. R. Murphy, Waco maintenance foreman, says: "The ease of operation and flexibility of P. S. stokers are outstanding."



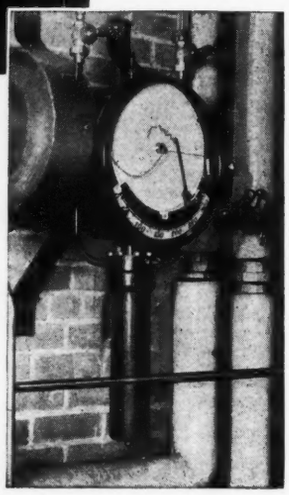
The position of the two Pneumatic Spreader stokers at the Waco plant illustrate the flexibility of P. S. installations. Here both hoppers are located side-by-side within the enclosed coal bin. This facilitates loading and keeping the boiler room clean. The location of P. S. stokers is not confined to the boiler room floor level . . . they can be set at floor level or above or below, to best suit the plant's arrangement.

Free Iron Fireman Engineering Survey

Iron Fireman engineers are ready to make a free engineering survey of your boiler plant. For free survey or P. S. catalog, write Iron Fireman Manufacturing Company, 3311 West 106th Street, Cleveland, Ohio.

IRON FIREMAN AUTOMATIC COAL STOKERS

LET THIS METER HELP STRETCH YOUR STEAM



● The unprecedented demand for steam, coupled with the difficulty of obtaining new generating equipment, makes it essential to stop waste and squeeze every pound of steam from present generating equipment.

To do this most effectively, you need ADSCO Steam Flow Meters. They provide information that will enable you to

1. Establish the proper load distribution among boilers.
2. Center attention on the department or unit using excess amounts of steam.
3. Coordinate steam consumption with steam production.

In these ways, it may be possible to regulate your steam supply sufficiently to carry you through this critical period.

ADSCO Steam Flow Meters record and totalize on direct reading evenly divided charts, with exceptional accuracy at all rates of flow. They can be used for steam, water, compressed air or gas.

Write us regarding your meter problems—also, ask for Bulletin No. 35-83.

AMERICAN DISTRICT STEAM COMPANY
NORTH TONAWANDA, NEW YORK

MAKING "UP-TO-DATE" STEAMLINE EQUIPMENT FOR OVER 60 YEARS

LET ADSCO FLOW METER TELL YOU HOW MUCH . . . WHEN . . . WHERE

North Carolina—U. S. Eng, 33 Customhouse, Charleston, S. C., awarded contract constructing air conditioning sys, Mecklenburg Co, to Page & Co, 219 S Mint St, Charlotte, under $50,000.

Ohio—U. S. Eng, 700 Union Guardian Bldg, Detroit, Mich., awarded contract installing 132-kv step-down substation and electrical work, Cuyahoga Co, to Gustav Hirsch Organization, 310 W Broad St, Columbus, under $1,000,000.

Ohio—U. S. Eng, Wright Field, Dayton, awarded contract relocating temporary heating plant, Greene Co, to Lieb-Jackson, Inc, 337 S High St, Columbus, under $50,000.

Ohio, Cleveland—Republic Steel Corp, Republic Bldg, awarded contract constructing 22x40 ft and 29x61 ft concrete, brick pump bldg, to United Engineers & Constructors, 1401 Arch St, Phila., Pa. Est, $40,000.

Ohio, Columbus—Timken Roller Bearing Co, 1025 Cleveland Ave, awarded contract constructing two 2 story factory bldgs and boiler house, 999 Cleveland Ave, to Hadlock-Kill Co, 2169 E 33 St, Cleveland, $150,000.

Oklahoma—U. S. Eng, 231 W Main St, Denison, Tex, awarded contract for air conditioning sys, Jackson Co, to Dallas Air Conditioning Co, Inc, 3500 Commerce St, Dallas, Tex., under $50,000.

Tennessee—Southern Acid & Sulphur Co, Columbian Mutual Tower, Memphis, constructing plant, awarded A-E-M contract to Lummas Co, 420 Lexington Ave, New York, N. Y. Est $2,000,000. Defense Plant Corp will finance.

Tennessee—War Dept, Constitution Ave at 20 St N W, Wash., D. C., awarded contract constructing air conditioning sys in plant, to T L Herbert & Son, 174 3 Ave N, Nashville. Est $50,000. Industrial company will operate.

Texas—Industrial company awarded contract constructing bldgs, facilities to E S Badger Corp, LaPorte Rd, Houston. $1,500,000. Defense Plant Corp will finance.

Texas—Industrial company awarded contract constructing plant, to M W Kellogg Co, Bankers Mortgage Bldg, Houston. $3,500,000. Defense Plant Corp will finance.

Texas—Industrial company awarded contract constructing plant bldgs, to Fluor Corp, Mellie Esperson Bldg, Houston. $875,000. Defense Plant Corp will finance.

Texas—Industrial company awarded contract constructing plant bldgs, to Lummus Co, 425 Bway, Houston, approx. $2,300,000. Federally financed.

Texas—Reconstruction Finance Corp, 811 Vermont Ave, N W, Wash., D. C., awarded contract constructing addnl plant bldgs to Foster-Wheeler Corp, Port Arthur. Est. $3,000,000. Industrial company will operate.

Texas—U. S. Eng, 231 W Main St, Denison, awarded contract for air-conditioning bldgs, to AAA Air-Conditioning Corp, Love Field, Dallas, $50,000-$100,000.

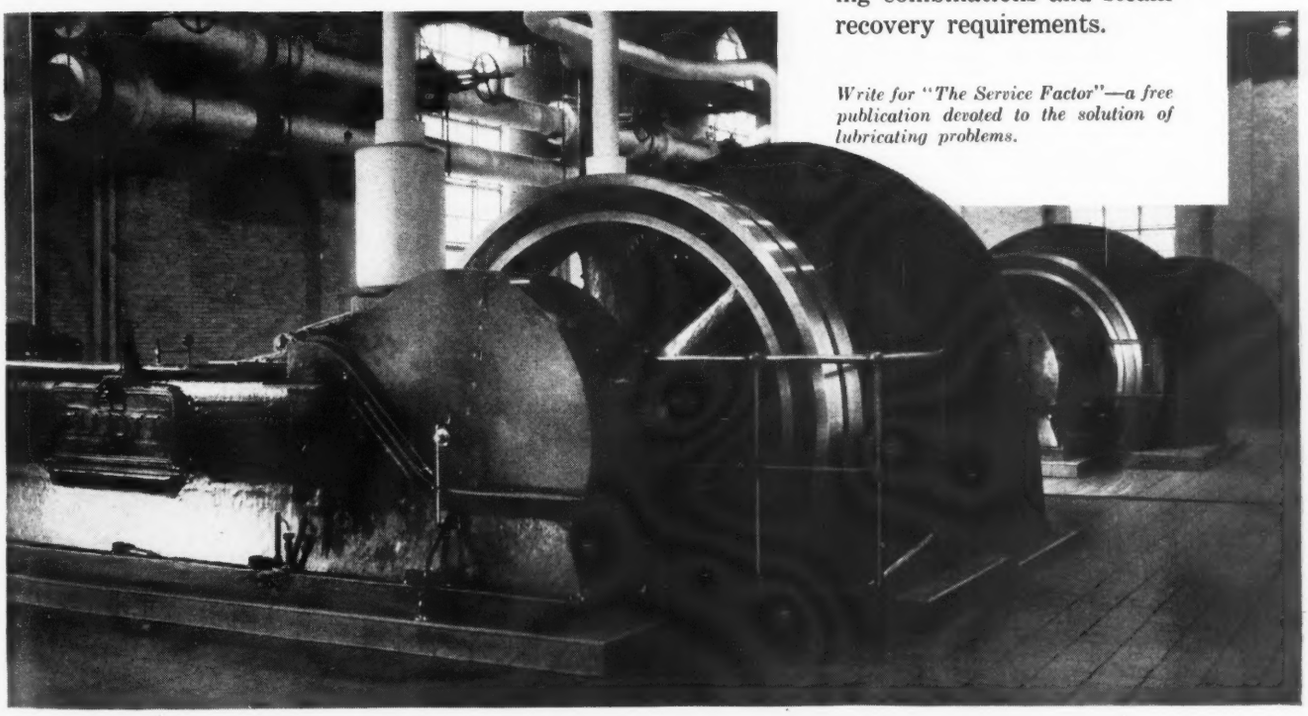
Texas—U. S. Eng, 231 W Main St, Denison, awarded contract furnishing, installing air conditioning refrigerating equip, Tarrant Co, to Worthington Pump & Machinery Corp, 401 Worthington Ave, Harrison, N. J., $100,000-$500,000; steam-generating unit, Tarrant Co, to Riley Stoker Corp, 9 Neponset St, Worcester, Mass., $50,000-$100,000.

Utah—Columbia Steel Co, Russ Bldg, San Francisco, Calif., awarded contract constructing housing, incl water, sewer, electric power facilities, grading, streets, to W E Ryberg Co, Terminal Bldg, Salt Lake City, and Strong & Grant, Spring-

SECOND FRONT STRATEGY needs home front strength. For maintenance of peak operating efficiency and necessary conservation of equipment in *STEAM POWER* plants use

...SINCLAIR STEAM CYLINDER and VALVE OILS. These oils are designed for *correct* power house lubrication under all operating combinations and steam recovery requirements.

Write for "The Service Factor"—a free publication devoted to the solution of lubricating problems.

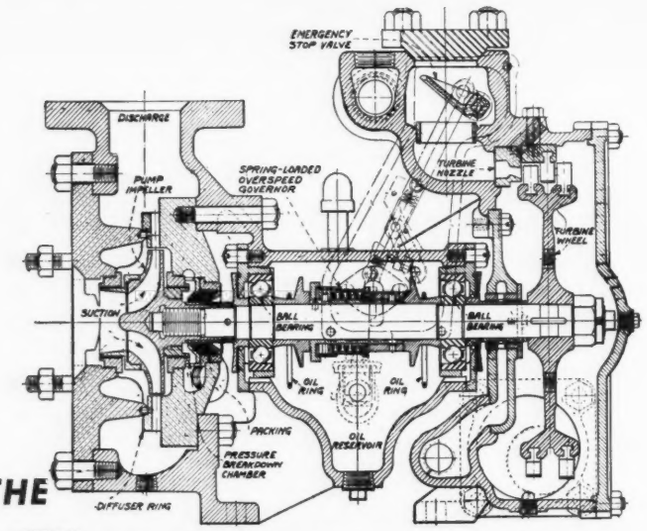


SINCLAIR INDUSTRIAL OILS

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE NEAREST SINCLAIR OFFICE

SINCLAIR REFINING COMPANY (Inc.)

2540 West Cermak Road, Chicago • 10 West 51st Street, New York City • Rialto Bldg., Kansas City • 573 West Peachtree Street, Atlanta • Fair Building, Ft. Worth



THE **COFFIN-Steam Turbine CENTRIFUGAL PUMP**

The Coffin Centrifugal Pump provides a small, compact and highly efficient unit for all boiler feed installations. It represents seventeen years of specialized engineering devoted to the design and development of centrifugal pumps.

It consists of a complete turbine and pump unit mounted on one shaft and housed in a single steel casting.

The pump impeller is single stage and overhangs the shaft on a solid hub. It is in perfect hydraulic balance. The steam turbine has a single pressure stage and two velocity stages.

Two special precision ball bearings support the entire shaft assembly. The bearings are lubricated by oil rings adjacent to each bearing.

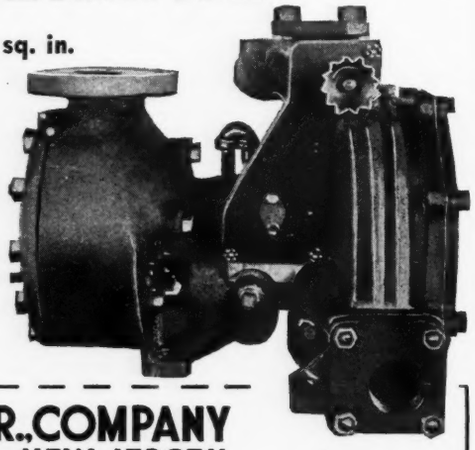
A spring loaded governor mounted on the shaft guards against overspeed. Manual means are provided for tripping and resetting to test operation.

All wearing parts are 100% interchangeable and are held to precision tolerences by limit gauges.

Size and weight is beyond comparison. The 200 G. P. M. 600 LB. Coffin Pump assembly weighs approximately 550 pounds. Its size is 20¼ x 27 x 33 inches.

PRESSURES TO—750 Lbs. per sq. in.

DELIVERIES TO—500 G.P.M.



Mail the Coupon

THE J. S. COFFIN, JR., COMPANY
ENGLEWOOD, NEW JERSEY

Please Send Descriptive Bulletin I-21

NAME

COMPANY

ADDRESS

P.W.

ville. Est between $2,000,000-$3,000,000. Defense Plant Corp will finance.

Utah—U. S. Eng, 32 Exchange Pl, Salt Lake City, awarded contract constructing air conditioning sys, Weber Co, to Fox & Co, Ogden, under $50,000; concrete construction, Weber Co, to W W Gardner, Salt Lake City, under $50,000.

Utah, Magna—Utah Copper Co, Geo Earl, ch engr, Kearns Bldg, Salt Lake City, awarded contract constructing brickwork new central power plant, to Ralph E Child Co, Springsville, approx $100,000.

Virginia—U. S. Eng, Standard Oil Bldg, Baltimore, Md., awarded contract constructing cold storage plant addn, alteration, Dinwiddie Co, to Claborne & Taylor, Inc, 117 S 2 St, Richmond, under $50,000.

Wis., Kenosha—Nash-Kelvinator Corp, 5626 25 Ave, awarded contract constructing office bldg, heat treating pit, Substation 1, to Hunzinger Constr Co, Sta K, Milwaukee, est $42,000. E W Bernitt, c/o owner, engr.

New Equipment

(*Continued from page* 140)

84-in. square table tilts from 45 deg in one direction to a vertical position in the other. Unit provided with T-slots for readily attaching work to table top. Rotates a full 360 deg in either direction—controlled through remote push-button station. Tilts and turns simultaneously, and has double tilting gear segments beginning from distribution of load. Base frame is of massive steel all-welded construction. *Industrial Div, Ransome Machinery Co, Dunellen, N. J.*

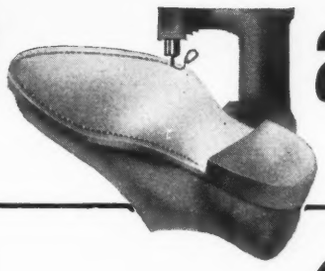
Thermostat

ACTUALLY TWO THERMOSTATS in one, the DSK Series thermostat has been added to the extensive line of SK Series thermostats. Temperature ranges are 300, 450 and 700 F. It can be connected as two single-pole single-throw switches or as one single-pole double-throw switch. Recommended electrical rating is 500 watts non-inductive load at 115-230 volts, ac. Each individual thermostatic element is independently adjusted by its respective adjusting screw on the mounting bracket. *George Ulanet Co, 92 East Kinney St, Newark, N. J.*

Synchromatic Relay

SYNCHROMATIC RELAY for field application makes possible more satisfactory synchronous motor starting, according to the company. Relay consists of two elements, one speed responsive and the other time responsive. Speed responsive element is a current relay and the time-responsive element is a rotary drum switch. Both elements simple in design, rugged and trouble-free in construction.

Give it a New Wearing Surface

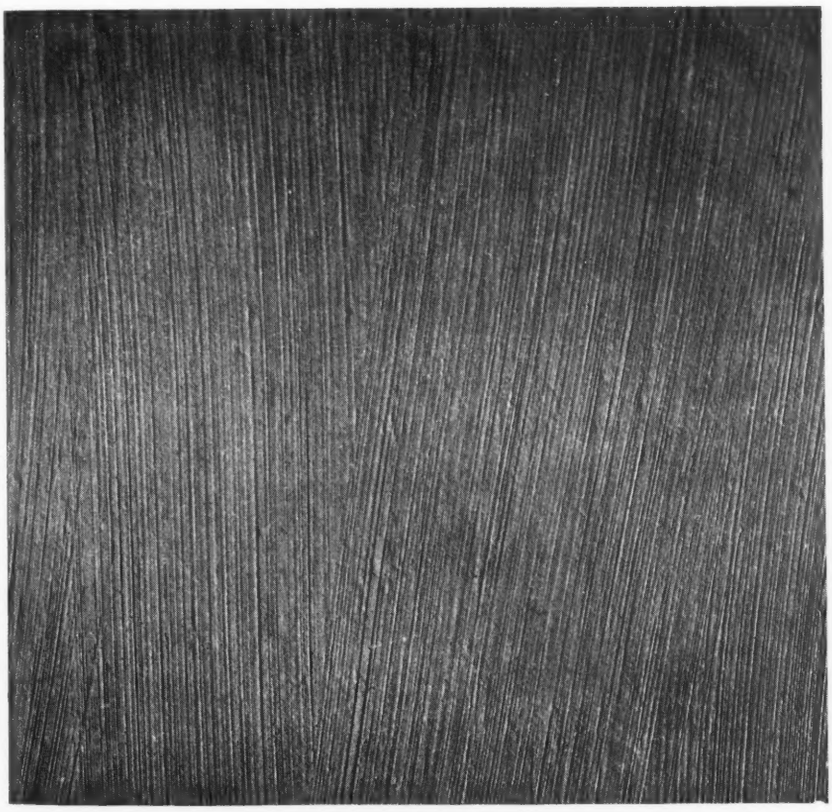


APEXIOR

ADDS EXTRA LIFE TO BOILER METAL

No one, in times like these, overlooks any chance to renew the life of valuable possessions — be they shoes or tires.

Prolonged operation of old boilers — even those approaching condemnation — is a proved fact . . . with APEXIOR. If the boiler, when cleaned, can undergo the required hydrostatic test, it can be APEXIORIZED and kept on the line for years.



APEXIOR . . . a Renewable Wearing Surface

APEXIOR No. 1, brush-applied to boiler tubes and drums, adds a long-lasting top-surface to the metal—taking the wear and resisting corrosion. The metal itself is never touched by erosion, corrosion or scale. Scale is prevented from binding—it is easily cleaned off with a wire brush.

The Apexior "skin" is simple to renew. One-coat resurfacing with a hand or rotating brush is all that's needed — every two or three years.

APEXIOR guarantees good metal condition . . . no other protection offers the same assurance and security

Men who demand top efficiency from steam boiler and turbine equipment have used APEXIOR for years—as a supplement to feed-water treatment. In the job of getting peak production from irreplaceable equipment, APEXIOR should be given your full consideration.

ECONOMIZE . . .

APEXIORIZE

APEXIOR
REG. U.S. PAT. OFF.

THE DAMPNEY COMPANY OF AMERICA

PROTECTIVE COATINGS FOR STATIONARY BOILERS, LOCOMOTIVES AND STEAMSHIPS

HYDE PARK · BOSTON · MASSACHUSETTS

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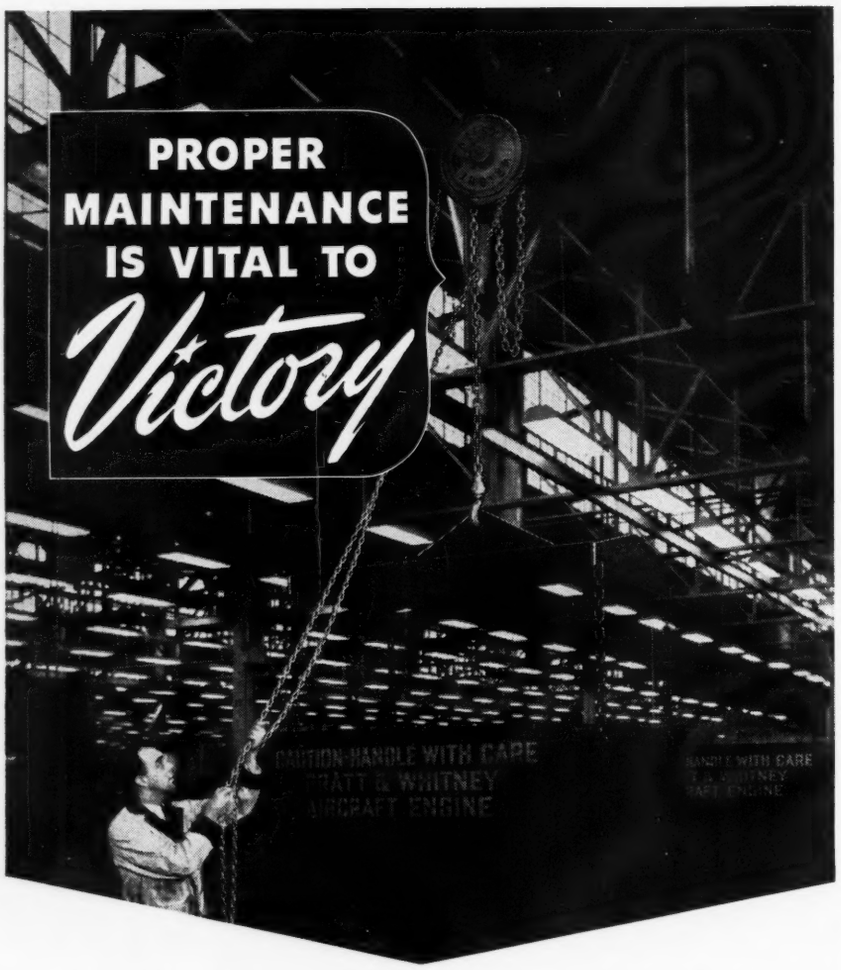

WRIGHT *Improved High Speed* HOISTS

ARE FAMOUS FOR THEIR ABILITY TO STAND ABUSE—HELP THEM TO TAKE IT NOW—PROTECT THEM

The No. 1 precaution is: ***Don't Forget the Grease Gun!*** A busy **WRIGHT HOIST** needs thorough lubrication once a month. Keep your load chain well lubricated, too.

Wright's No. 2 precaution is: ***Don't Overload Your Hoist.*** Watch both the top and bottom hooks if in doubt about the carelessness of workmen. Wright hooks are drop-forged from special steel which, when overloaded, give visible warning by slowly opening. Wright load chains are also high in elastic limit. Don't continue to use hooks or chains that have stretched.

Take proper care of your **WRIGHT HOIST** so that it lasts. Where properly lubricated and maintained, many **WRIGHT HOISTS** have given continuous, trouble-free service for 20 to 25 years. You can find the name of your nearest Wright distributor in the telephone book.

WRIGHT MANUFACTURING DIVISION
York, Pa., Chicago, San Francisco, New York
In Business for Your Safety

AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT • CONNECTICUT

and need no critical adjustments. Relay meets all six basic requirements for synchronous motor control: (1) Maximum non-synchronous speed attained before field application, (2) minimum power required because synchronizing is never attempted before maximum speed is attached, (3) synchronizes in minimum time consistent with maximum speed, (4) positive synchronizing sequence, (5) minimum line disturbance because of favorable rotor position, and (6) automatic pull-out protection. *Westinghouse Electric & Mfg Co, East Pittsburgh, Pa.*

Exhauster, Ventilator

OCTOPUS EXHAUSTER and ventilator specifically designed for use in welding departments, ship holds, etc. Unit may be placed or hung in any convenient place between the working area and the open air. It is connected by means of flexible metal hoses to the area to be ventilated. The unit is powered by a heavy-duty ball-bearing motor equipped with over-load protection. Newly developed blower wheels designed especially for this unit. Exhauster can be converted into a fresh air ventilator by simply changing the position of the tube adapter which is part of the equipment. *Chelsea Fan & Blower Co, 1206 Grove St, Irvington, N. J.*

Industrial Humidifier

CARRIER HUMIDIFIER provides humidified air, automatically controlled, cooling by evaporation; tempering, cleaning and uniform circulation of air in addition to humidification. Features of the new industrial humidifier include the suitability to any size plant, requires no floor space, uses no distributing ducts and is easily installed and moved to meet plant changes in production or machine layouts. Drip pan on ball-bearing rollers moves on a track, permitting complete access to the interior of the unit and humidifying packs from the bottom. Air outlet is hinged to swing aside, providing an opening to the fan and fan motor. *Carrier Corp, Syracuse, N. Y.*

Arc-Control Station

ARC-CONTROL STATIONS are said to result in greater welding output per machine, better control by the operator, and improved welds on thin gage metal. Arc-control stations are made in capacities of 75 amp and 150 amp. They are auxiliary devices, connected in series with the welding circuit of any constant potential arc welding generator. Most

The why of better turbine lubrication with

GULFCREST OIL:

It's Alchlor Processed!

THE performance records of Gulfcrest Oil in turbine systems of many of the leading power plants in the country are unmatched. Here's the important reason why:

Gulfcrest Oil is not only refined by conventional methods, but is super-refined by the Gulf Alchlor Process, the most thorough and effective method for removing chemically active hydrocarbons as well as the general run of impurities found even in the best selected crude oils. As a result, Gulfcrest Oil has highest resistance to oxidation, highest resistance to acidity and sludge, and gives maximum kilowatt-hour performance. Gulfcrest Oil is the world's finest turbine lubricant!

We suggest that you ask the Gulf engineer in your vicinity to give you complete details about this quality lubricating oil. Or send the coupon below for the brochure "Gulfcrest Oil" — no obligation, of course.

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3800 Gulf Building, Pittsburgh, Pa.

Please send me my copy — no charge — of the brochure "Gulfcrest Turbine Oil."

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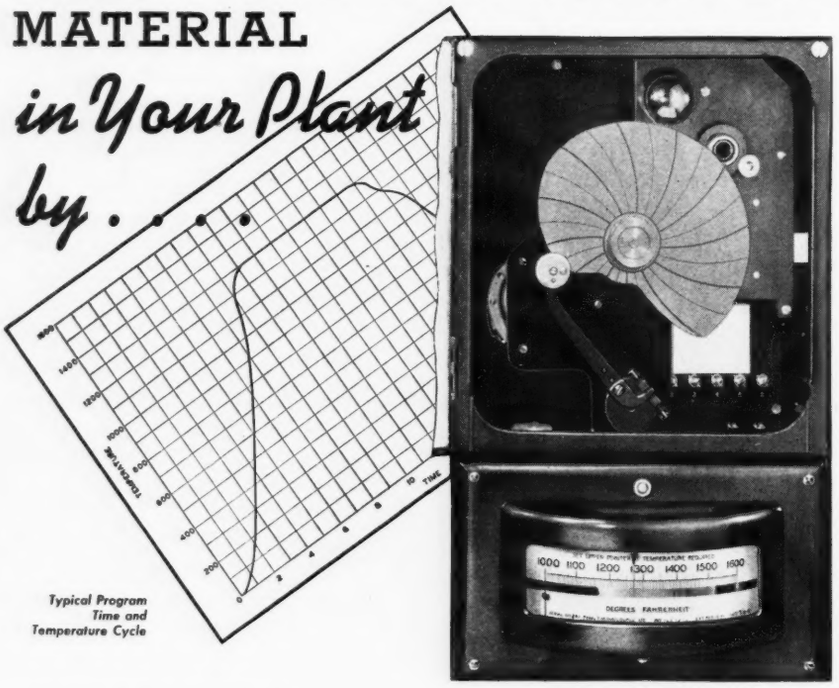


Typical Program Time and Temperature Cycle

Program Capacitrol

AUTOMATIC ENFORCEMENT of . . . your HEATING or COOLING CYCLES

Wheelco UNIVERSAL Controllers, with Program Control integrally incorporated, will permit you to produce MORE, BETTER—WITHOUT WASTE.

These Controllers provide dependable enforcement of any heating or cooling cycle, with completely automatic temperature regulation, plus the Proved-in-Service Superiority of "Electronic Principle" Control, which eliminates the faults inherent in all mechanical controllers.

Program Control is effected by means of a synchronous motor driven disc, which is so contoured as to move an arm, mechanically Coupled to the temperature setting lever of a Wheelco "Electronic Principle" Controller, to produce the desired program. Discs can be contoured in your own shop.

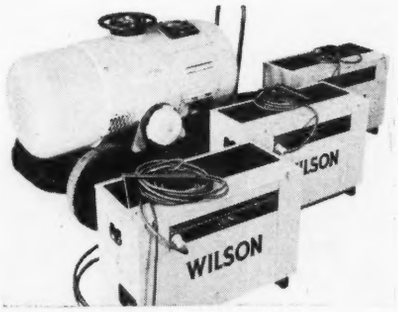
UNIVERSAL Program Controllers are available as Capacitrols, Potentio-trols or Resistance Therm-otrols, and adaptable to all types of processes for measuring, indicating and controlling temperatures from —50 to +3600°F., or equivalent °C.

Write for your FREE copy of Bulletin No. Z6000.

Wheelco Instruments Co.

863 W. HARRISON STREET • • • CHICAGO, ILLINOIS

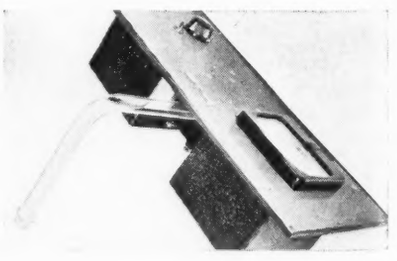
Originator of "Electronic Principle" Temperature Controls



conventional drooping voltage generators can be converted quickly and easily to constant potential. When two or more arc-control stations are hooked up to a single generator, a like number of welding arcs can be operated simultaneously. Each operator can regulate his own current and weld as he sees fit without affecting the other in any way. Unit accomplishes closer control of the welding current, individual remote control of current, current control to assure sound smooth welds at the end of each bead, and maximum usefulness of each arc-welding generator. Illustration shows three Honey Bee arc-control stations attached to a Wilson Hornet welder. *Wilson Welder & Metals Co, New York, N. Y.*

Colorimeter

MODEL 400-S designed to register light transmission of a liquid passing continuously through instrument. Operating principle of this instrument is similar to the one of the usual photoelectric colorimeter. Light from an incandescent lamp passes through a color filter and through the liquid, then impinges on a barrier-layer photocell, the current of which is registered by an electrical indicating instrument. Distinctive feature of the continuous-flow colorimeter lies in that the liquid under test passes through a glass tube rather than being contained in an absorption cell or a test tube. This makes instrument suitable for the continuous control of chemical processes in which the color or turbidity of a liquid must be checked either as a measure of its concentration or as an indication of some other chemical or physical condition. Once calibrated by means of a solution of known concentration, instrument indicates the con-



HERE'S WHY *Scrap* IS SO IMPORTANT!

SCRAP iron or steel turnings, clippings, short ends, worn out or broken tools, spoiled work, idle and obsolete machinery, etc., are valuable as raw materials for remelting in the production of new steel.

Through previous refining, ingredients undesirable in steel have been reduced—thus the use of properly prepared scrap speeds the refining process and enables new steels to be produced more rapidly. Recapture of scrap—from your plant—means opportunity to save time and labor—hence more steel.

Certain scrap contains valuable alloying elements such as nickel, molybdenum, tungsten, etc. which can and must be recovered to augment primary supply to meet tremendously increased demand for constructional and high speed alloy steels for more planes, tanks, guns, ships, tools and machinery essential to the war effort.

To be of maximum immediate assistance, scrap should be segregated by composition wherever possible. Turnings, spoiled work etc. should be identified (SAE, AISI, NE etc. grade number) at the machine where they are generated and so handled as to avoid contamination by waste material or scrap of other types and grades.

The metallurgical experience of our staff is available to aid you in technical phases of metal salvage.

KEEP SCRAP MOVING INTO WAR PRODUCTION!

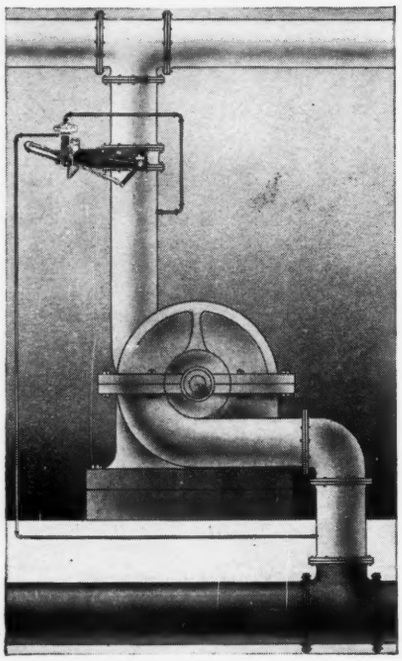
THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK, N. Y.

HOW TO PROTECT Pumping Units and Prevent Water Hammer

For example, with 55 p.s.i. in the common header and a 2 lb. lift, a differential control, utilizing the hydraulic cylinder, would be set for approximately 56 lbs. The Butterfly Valve remains open as long as a greater differential than 56 lbs. is maintained.

In case of pump or power failure, the flow through the pump reverses. The natural tendency of an R-S Valve is to close itself under a pressure drop. The differential now drops below 56 lbs. and the cylinder closes the valve wedge-tight. It will remain closed until the pressure differential is regained. When this takes place, the valve opens gradually and normal pumping operations are resumed.

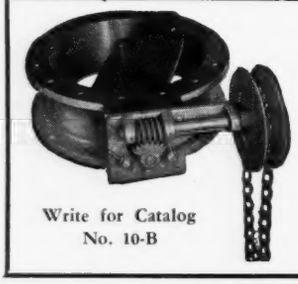
Closing of the valve causes no water hammer since the valve can not move any faster than the bleeding of the cylinder discharge permits.



A 125-lb. R-S Butterfly Valve, equipped with hydraulic cylinder for automatic operation, serves a triple purpose where a battery of pumps discharges into a common header. Prevents a synchronous-driven pump from grabbing all the load when the pump is started, prevents reverse flow through the pump and eliminates water hammer.

Declutching unit with self-locking hand wheel control also available for similar installations. Sizes to 84-inches. Suitable for high or low temperatures and pressures to 600 lbs. for the positive control and wedge-tight shut-off of liquids and gases in chemical industries, water works, refineries, ordnance and power plants.

R-S PRODUCTS CORPORATION, 4536 Germantown Ave., Phila., Pa.



Write for Catalog No. 10-B

In the three-inch sizes and upward, chain wheel operation is desirable for inaccessible locations. Similar in all details to the hand wheel valves with the exception of the chain wheel which is mounted on the worm shaft in place of the hand wheel.

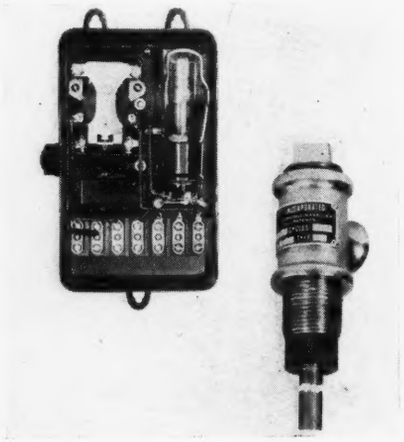
Used for the positive control and wedge-tight shut-off of any material that flows or is forced through a pipe.

R-S Streamlined BUTTERFLY VALVES

centration directly and continuously, obviating the necessity of taking samples and analyzing them at regular intervals. *Photovolt Corp, 95 Madison Ave, New York, N. Y.*

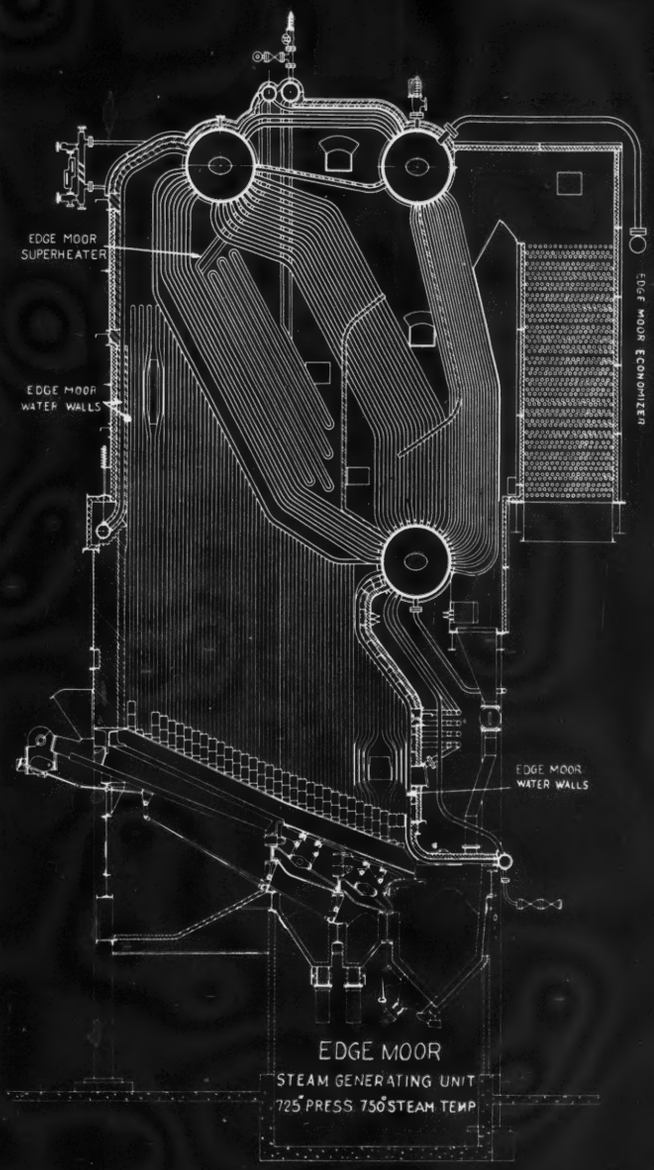
Water-Detector Lock

PHOTOSWITCH TYPE P15NH is designed to indicate water seepage in gasoline storage tanks. Probe fitting is mounted in a standard pipe fitting on the top surface of the tank, probe rod projecting down through the tank to the level at which water seepage is to be detected, usually 3 in. from the tank bottom. Water detector can be located at any point remote from the tank and wired to the probe. While the probe rod is entirely immersed in gasoline and as long as water seepage has not reached the probe, no signal sounds. When water seepage rises to contact the probe tip, an electrical circuit is completed through the water itself and the water-detector lock operates, turning off pumping equipment and actuating an alarm circuit. *Photoswitch Inc, 21 Chestnut St, Cambridge, Mass.*



Fuel Oil Treatment

XZIT FUEL OIL TREATMENT especially designed to eliminate sludge formed by condensation in oil tanks which builds up and coats the bottoms and sides of these tanks, making periodic cleaning necessary. Xzit is soluble in oil, but not in water, and when dissolved in fuel oil will permeate through the entire tank and cause globules of water in the sludge to be precipitated out and settled to the bottom, together with any dirt, silt or other foreign material. This residue of water and dirt is easily pumped out and discarded when the tank is drained. Xzit accomplishes this by decreasing the surface tension of the oil, causing it to repel the water. Fuel oil treatment said to be especially beneficial to operators of diesel engines. Surface tension and pour point of the oil is



Edge Moor 3-Drum Boiler Unit for Large Powder Company

Two Edge Moor three drum boiler units are each producing 150,000 lbs. of steam per hour at a pressure of 725 lbs. and a final steam temperature of 750° F. for a large powder company. Boiler furnaces are completely water cooled and high efficiency is obtained by the inclusion of an Edge Moor economizer of the horizontal tube return bend type.

Since all engineering work has been completed, these units can be reproduced with a minimum of delay.

Complete installation service is available through Edge Moor including Boilers, Superheaters, Water Walls, Economizer and Air Preheater.

EDGE MOOR IRON WORKS, INC. 30 ROCKEFELLER PLAZA NEW YORK, N. Y.

KANSAS CITY CHICAGO DETROIT RICHMOND, VA.

IN CANADA:— UNITED STEEL CORPORATION, LTD., TORONTO, MONTREAL

ACCURATE
PRESSURE REGULATION

With Stickle Self-Contained and Pilot-Operated Valves, Made in Types and Sizes and Construction to meet Specific Requirements and Conditions in Wide Field of Application

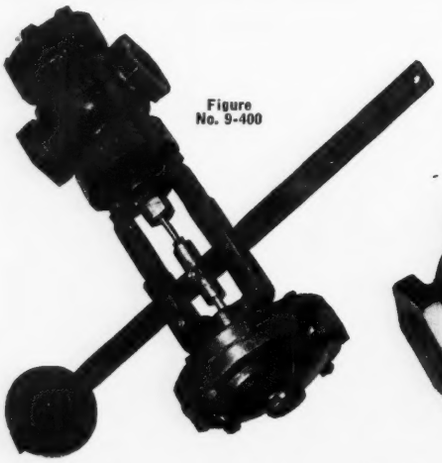


Figure No. 9-400

STICKLE STANDARD REGULATING VALVE

A double-seated, semi-balanced valve, designed for use in connection with processing work and heating, and developed to meet stringent requirements for accuracy and dependability. Seven sizes—½" to 6". Easy to install. All working parts renewable. Spring loaded Diaphragm Operated and Lever and Weight Diaphragm Operated types.

Figure No. 208

STICKLE BALANCED LEVER, WEIGHT LOADED VALVE

A single seated, balanced valve for dead end service. Permits a constant reduced pressure to be maintained against a variable supply pressure. Internal parts, including valve and seat, interchangeable. May be repaired at point of use. Eight sizes—¾" to 4". Also available in Balanced Spring Loaded Diaphragm and Balanced Lever types.

Figure No. 205

STICKLE SPRING BALANCED VALVE

Three sizes—½", ¾" and 1". Renewable valve and seat. Diaphragm case detachable from valve body. Valve can be reground without removing valve body from line. Ideal for small water line reductions and individual installations on steam tables, jacketed kettles, unit heaters and other small equipment, and adaptable to any standard service on water, steam or air.

Figure No. 220

AUXILIARY PILOT-OPERATED LEVER VALVE

Built to supply close regulation and control under various conditions of initial pressure and reduced pressure requirements. Goes from closed position to wide open condition on one pound of fluctuation. Well adapted for bleeder turbine service. Smaller sizes used where live steam make-up is required and an accurate reduced pressure is necessary. Can be supplied in either 200—or 400—Series in lever type valve or in combination.

Write for Bulletins Nos. 235 and 435

STICKLE
STEAM SPECIALTIES COMPANY
2265 Valley Avenue, Indianapolis, Indiana

SPECIALIZING FOR 35 YEARS IN REDUCING THE COST OF STEAM

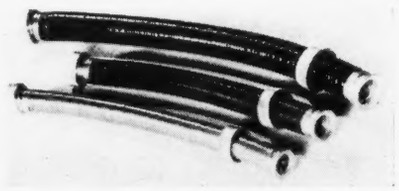
reduced. This makes oil flow easier, even at low temperatures. It makes oil atomization more efficient, and combustion more economical. Said to keep gummy deposits usually found in lines and ports in the solution. Carbon deposits in cylinders and exhaust lines are minimized, according to the maker. *Xzit Sales Co, 1031 Clinton St, Hoboken, N. J.*

Belt Dressing

BELT-LIFE MADE to transmit full power from motors to machines, raising belt efficiency from 50 to 95%. Belt-Life prevents restitching, avoids excessive pressure on the shaft bearer, preserves every sort of driving belt, and cleanses the pores thoroughly and prevents slipping, maker says. Belt-Life is guaranteed free from mineral oils, tar, resin, fatty acids, or other products which cause belt deterioration. *Belt Oil and Chemical Co, 1265 Broadway, New York City.*

Plastic Covered Conduit

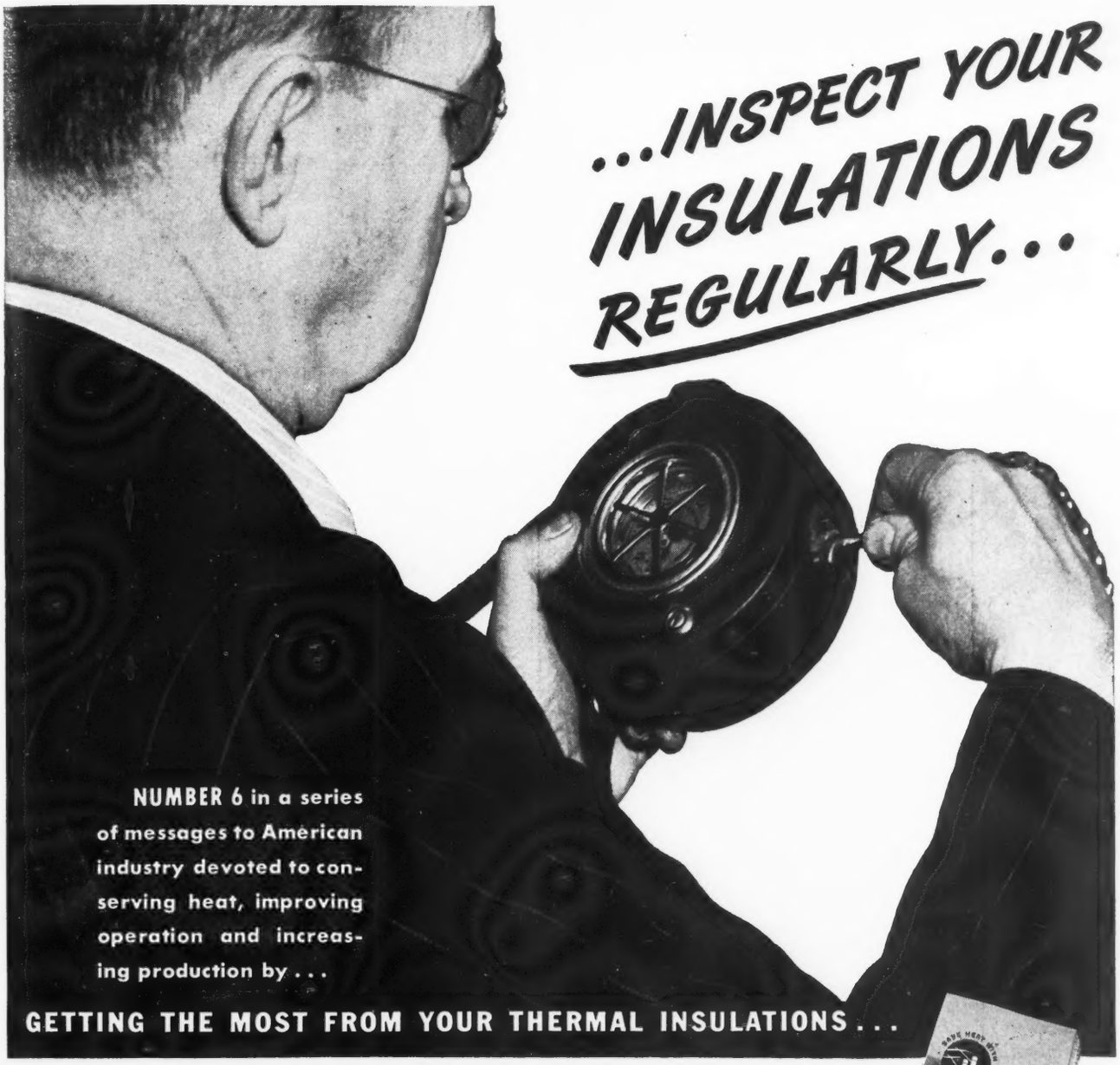
PLASTIC SKIN over flexible metal conduit protects the conduit itself and the wires inside against wear, abrasion, heat and most solvents, including gasoline and oil. Illustration shows Amerflex conduit covered with three different types of plastic. The nearest conduit is



covered with Transflex, a transparent plastic, said not to become brittle at sub-zero temperatures. Shown in the center of the illustration is a covering of Irv-O-Lite Xte 30. This, as well as Transflex, has high dielectric and tensile strengths. The Amerflex at the top is covered with Hyflex, a glossy, opaque plastic that resists brittleness at subzero temperatures. *Searle Aero Industries, Inc, Orange, Calif.*

Coating

CARBOZITE HIGH-TEMPERATURE-RESISTANT coating is a new specialized coating developed for resisting deleterious effects of temperature up to 2000 F. This coating will prevent the formation of scale and oxidation when applied to metal surfaces subject to direct flame. Coating also adaptable for application on the inside of fire walls to prevent the spalling of mortar and brick. When the coating is subjected to temperatures of 1,000 F, it will fuse to the surface on



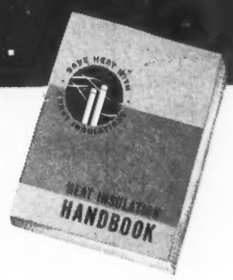
...INSPECT YOUR INSULATIONS REGULARLY...

NUMBER 6 in a series of messages to American industry devoted to conserving heat, improving operation and increasing production by . . .

GETTING THE MOST FROM YOUR THERMAL INSULATIONS . . .

As the periodic rounds of the watchman safeguard both plant and production, so the regular inspection and maintenance of your heat insulations will insure against the encroachment of costly heat losses. Even the best of insulations can suffer damage from service hazards and abuse. Unless the little losses are found and checked, totals can soon reach astonishing proportions.

Particularly under today's increased steam pressures and higher process temperatures, it is sound practice to check your insulations—and maintain them. It is equally good practice to specify only efficient, time-tested materials such as Ehret's 85% Magnesia for your additional service needs.



★ EHRET'S 85% Magnesia and many other Ehret heat insulating materials are fully treated, both as to selection and application, in the 176-page Ehret Heat Insulation Handbook. It will be furnished, without obligation, to those interested in getting the most from their thermal insulations. Write today for your copy of Handbook A-211.

EHRET MAGNESIA MANUFACTURING CO.
VALLEY FORGE, PENNA.

. . . THERE IS AN *EHRET* DISTRIBUTOR OR CONTRACTOR IN EVERY INDUSTRIAL AREA

BUYING MORE COAL THESE DAYS? . . .

Slash your coal bills!

. . . Pay only for B.T.U.'s received and get this information accurately with the . . . . .

IMPROVED STURTEVANT

Automatic

COAL CRUSHER *and* SAMPLER

If you're running your plant day and night to supply power for defense production, Sturtevant offers you an opportunity to make real savings in your coal buying. Here's how:

Feed your coal and coke into the Improved Sturtevant Automatic Coal Crusher and Sampler and get samples that are truly representative of all material passed through, crushed to a fineness of practically all minus 8 mesh screen size. Provision is made to obtain 5, 10 or 15% samples as desired.

32 HAND OPERATIONS ELIMINATED

By the Sturtevant method—32 of the 34 tedious operations ordinarily required by hand sampling are eliminated. In addition, greater accuracy and speed of sampling are assured. Ability to obtain and compare accurate samples of every barge or car of coal enable you to know exactly what you are paying for in terms of BTU's and thus determine the most economical coal for your purpose—and you *get* this important information before you burn it—insuring better boiler performance, lower maintenance and savings in your fuel bill. INVESTIGATE TODAY: SEND FOR BULLETIN 85.

For Savings . . .

"SAMPLE YOUR COAL BEFORE YOU BURN IT"

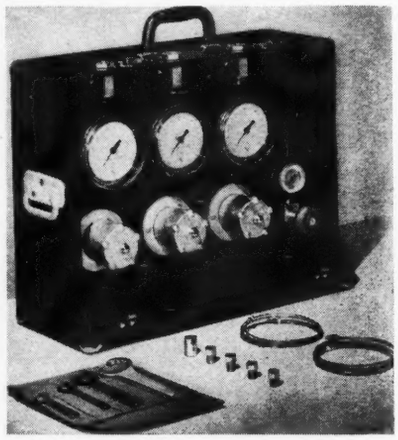
Sturtevant Mill Co.

103 Clayton St., Dorchester, Boston, Mass.

which it has been applied and form a vitreous protective coating. When so fused, it is resistant to the effects of acids and alkalies. Two applications of the coating are recommended for all installations. Each coat will dry hard within three hours. Approximately 150 sq ft per gal can be covered on the first coating, while the second coat will give 200 sq ft per gal. *Carbozite Corp, First National Bank Building, Pittsburgh, Pa.*

Gage Tester

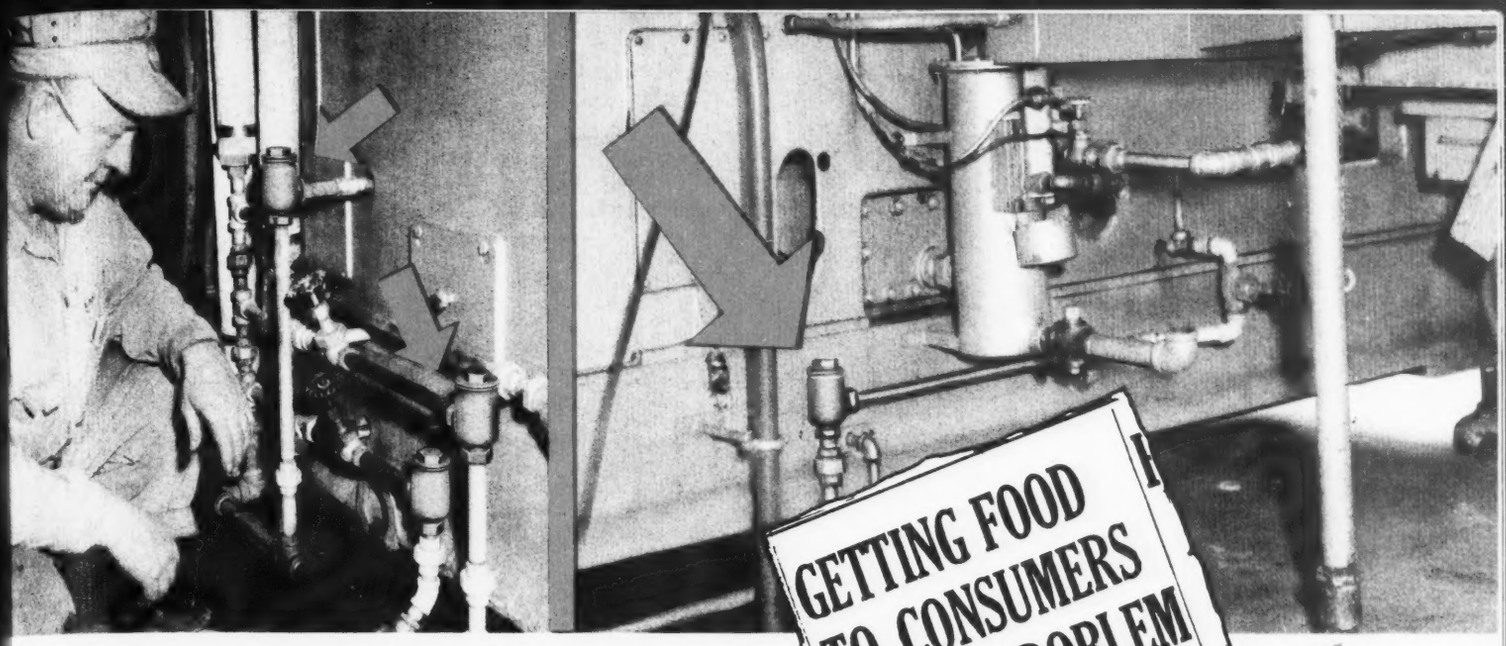
GROVE GAGE COMPARATOR permits service gages to be quickly and accurately checked in place without breaking line connections, in a fraction of the time usually required, according to the company. The time-saving feature of the Grove comparator particularly valuable and important whenever there is the slightest possibility of a gage having been damaged by momentary or sustained overpressure release, extreme vibration or shock of any sort. Necessary



testing pressures supplied from built-in high-capacity air cylinders which can be charged and recharged as often as necessary with clean dry gas, air or oxygen. Extremely fine degree of pressure control is made possible by three pressure loaders mounted below each test gage. The Grove loader serves as an accurate pressure-reducing valve with built-in automatic relief. Because of its large diaphragm-to-valve area ratio, it provides positive pound-by-pound controlled and maintained accuracy of delivery pressures, whether increasing, decreasing or constant. *Grove Regulator Co, Oakland, Calif.*

Balancing Machine

BEAR-DY-NAMIC BALANCING MACHINES operate under new sensitive and accurate balancing principle and indicate disturbing centrifugal force or force coupled with a high degree of accuracy. Both angular position and value or



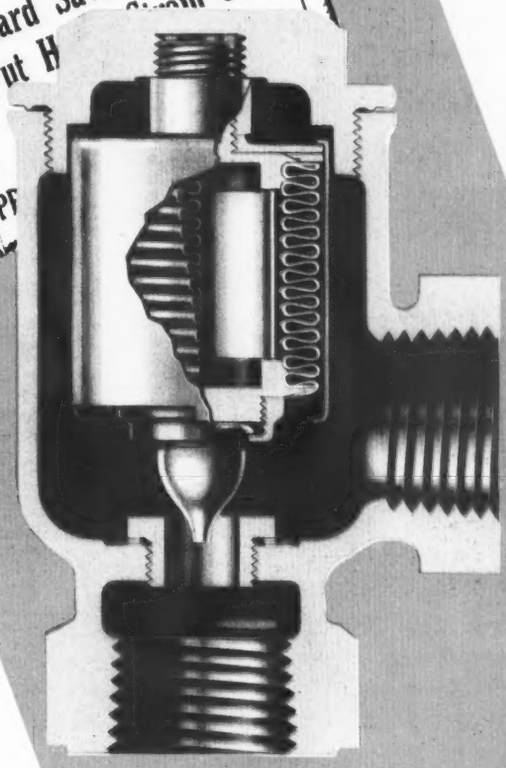
If it's a Steam-Process

SPEED UP WITH

SARCO No. 9 Steam Traps

Whenever you see a cluster of Sarco No. 9 Steam Traps you can be sure of several vital features in the equipment they serve.

1. No one steam coil can hold up another. They are all working at top speed.
2. No useful heat is escaping with the condensate. The No. 9 expels only the slightly cooled condensate.
3. There's no trouble starting up. It discharges all entrained air rapidly, being wide open when cool, which is also why it can't freeze.
4. Varying steam pressures will not affect the operation. No seats to change. It's the only thermostatic steam trap made for pressures up to 250 lbs.



The No. 9 has a powerful, snappy action due to the heavy wall, helically corrugated bellows made from flat blanks exclusively in the Sarco Factory at Bethlehem, Pa.

This trap has been carrying heavy loads in all types of process industries and on heating lines for a quarter of a century.

Try one in a tough spot and you will see the reason why.

SARCO Saves Steam

SARCO COMPANY, INC., 475 FIFTH AVENUE, NEW YORK

SARCO CANADA, LTD., 85 Richmond Street, West, TORONTO, ONTARIO

Represented in Principal Cities

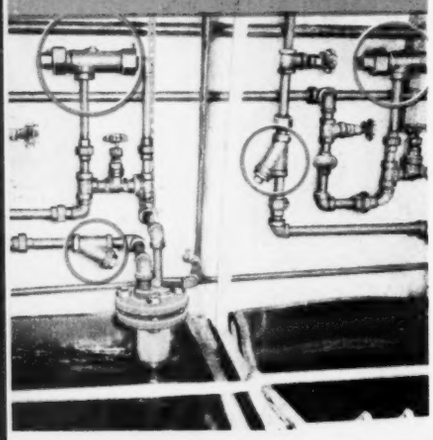
Simple

Temperature Controls for Industry

Elaborate equipment is not necessary to secure the advantages of automatic control of critical temperatures.

Sarco has made available simple, self-operated regulators which are providing adequate control on hundreds of applications at astonishingly low cost.

Take these three examples:



A manufacturer of records uses Sarco Thermotons on plating tanks.

1. At the cost of a good steam trap, the Sarco No. 87 Thermoton takes care of condensation removal and at the same time provides approximate temperature control of steam heated tanks, kettles or other small equipment. For the first time it has brought automatic control within the reach of small plating shops where it is used for all heated tanks, including washing and rinsing.

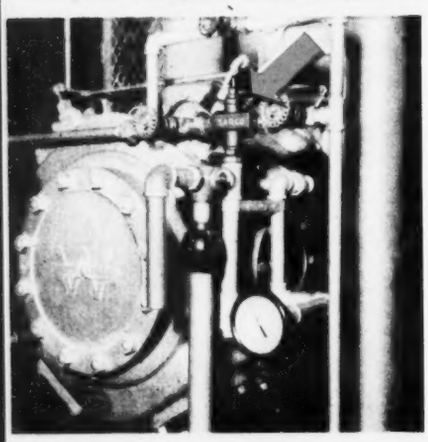
Catalog No. 550

A textile plant tried one TR-21 Temperature Regulator and now has four.

2. Sarco type TR-21 self-operated temperature regulators are standard equipment on water and oil heaters, for all types of process work such as cooking, evaporating, drying, or degreasing; also for cooling controls and air conditioning.

Powerful liquid expansion systems provide gentle throttling control. Valves are packless — no stuffing boxes to leak or stick.

Catalog No. 600



The TR—40 Cooling Control saved 75,000 cu. ft. of water a year in a chemical plant.

3. If you are interested in saving up to 50% of the cooling water used on air compressors, condensers, stills, internal combustion engines, or degreasers, you will want to investigate Sarco type TR-40 cooling control.

A low cost, rigid stem type, it is easy to install, prevents over-or under-cooling, and saves on lubricating oil as well as water.

Catalog No. 700 describes four different types in sizes from ⅜" to 8"

80% of all industrial temperature control problems can be solved by a simple self-operated Sarco Regulator or an inexpensive "on and off" Sarco Electric Control.

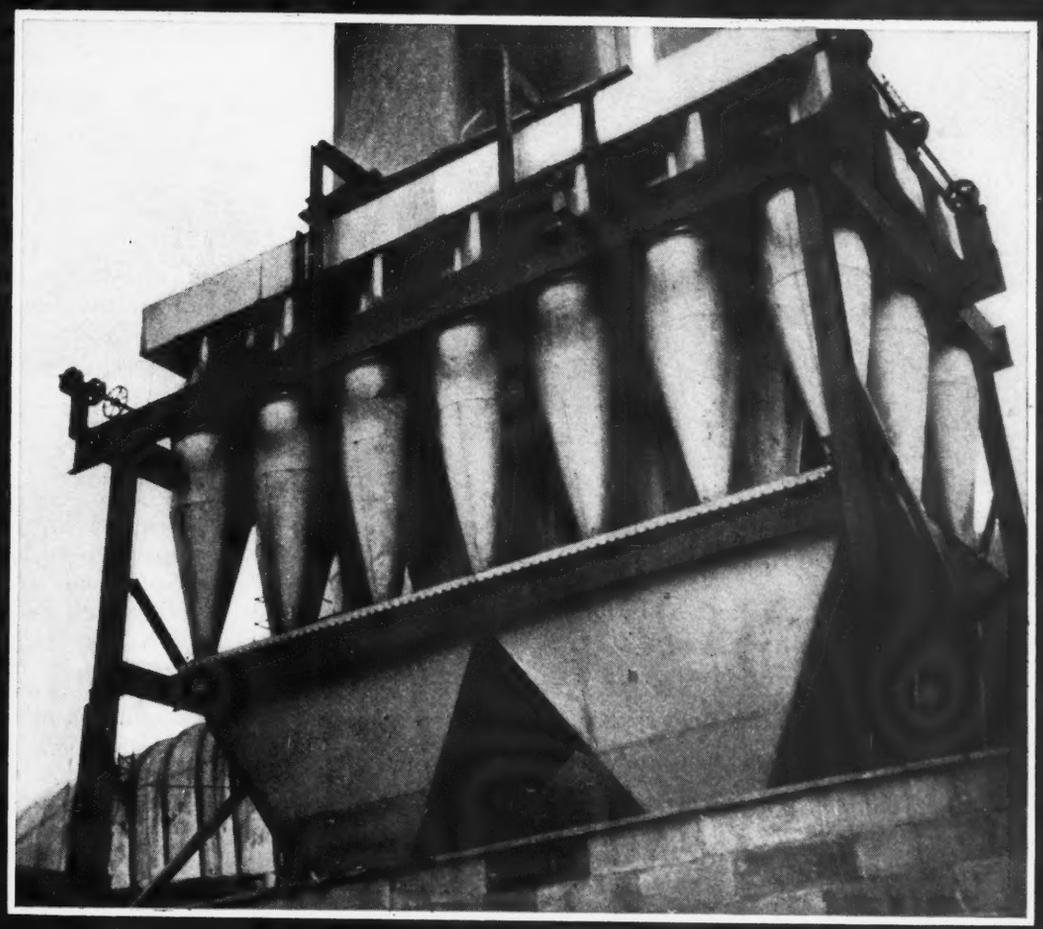
SARCO Saves Steam

SARCO COMPANY, INC., 475 FIFTH AVENUE, NEW YORK

SARCO CANADA, LTD., 85 Richmond Street, West, TORONTO, ONTARIO

Represented in Principal Cities

Eliminate the Dust Danger Zone!



Most complaints of dust come from within one mile of a power house . . . seldom beyond two miles.

You will have no complaints from this "danger zone" if you install a Thermix Dust Collector. For it removes 99% to 100% of the dust which would fall within one mile, as well as a high percentage of the less troublesome dust that travels five to ten miles in the average wind.

For more than 16 years we have been solving every type of dust problem. In your plant a Prat-Daniel engineer will gladly put this knowledge to work without any obligation on your part.

Write for full particulars and catalog No. 105.

PRAT-DANIEL CORPORATION, Port Chester, N. Y.
General Sales Agents
Thermix Engineering Co., Greenwich, Conn.
Representatives in Principal Cities

THERMIX

Tubular Dust Collectors
Controlled Multicyclones
Recirculator Dust Collecting Fans

...the "MEGGER" Tester is *ALWAYS READY* for use

When the need arises for emergency insulation testing of electrical equipment—it calls for immediate and positive action. "Megger" Insulation Testers are *always* ready for use, day or night, even in the most remote, isolated, inaccessible locations. The self-contained hand-cranked generator is a source of power that is reliable and wholly independent of any battery or other outside source. The "Megger" Tester is a complete unit in itself.

For occasional use, for periodic tests and for emergency tests, your "Megger" Tester is *always ready.* If you do not have full information on how to use and operate "Megger" instruments, write immediately for a free copy of the Pocket Manual of "Megger" Practice, No. 1420-P.

JAMES G. BIDDLE CO.
1211-13 ARCH STREET • PHILADELPHIA, PA.

"MEGGER"
TRADE MARK REGISTERED U.S. PAT. OFF.
Insulation Testers, Ground Testers and Ohmmeters

amount of unbalance shown at the same time. With these balancing machines it is unnecessary to static balance before a dynamic balance test can be made. Machine reveals whether a static or dynamic unbalance, or both, is present, without reversing ends of the body being balanced. Bear machines are available in a variety of models ranging from bench model to large floor and pit type models for balancing such rotating parts as armatures, fans, blowers, flywheels, hubs, drums, propellers, gears, impellers, pulleys, wheels, rotors, etc, weighing from 6 oz to 1000 lb. *Bear Mfg Co, Industrial Div, Rock Island, Ill.*

Phosphor

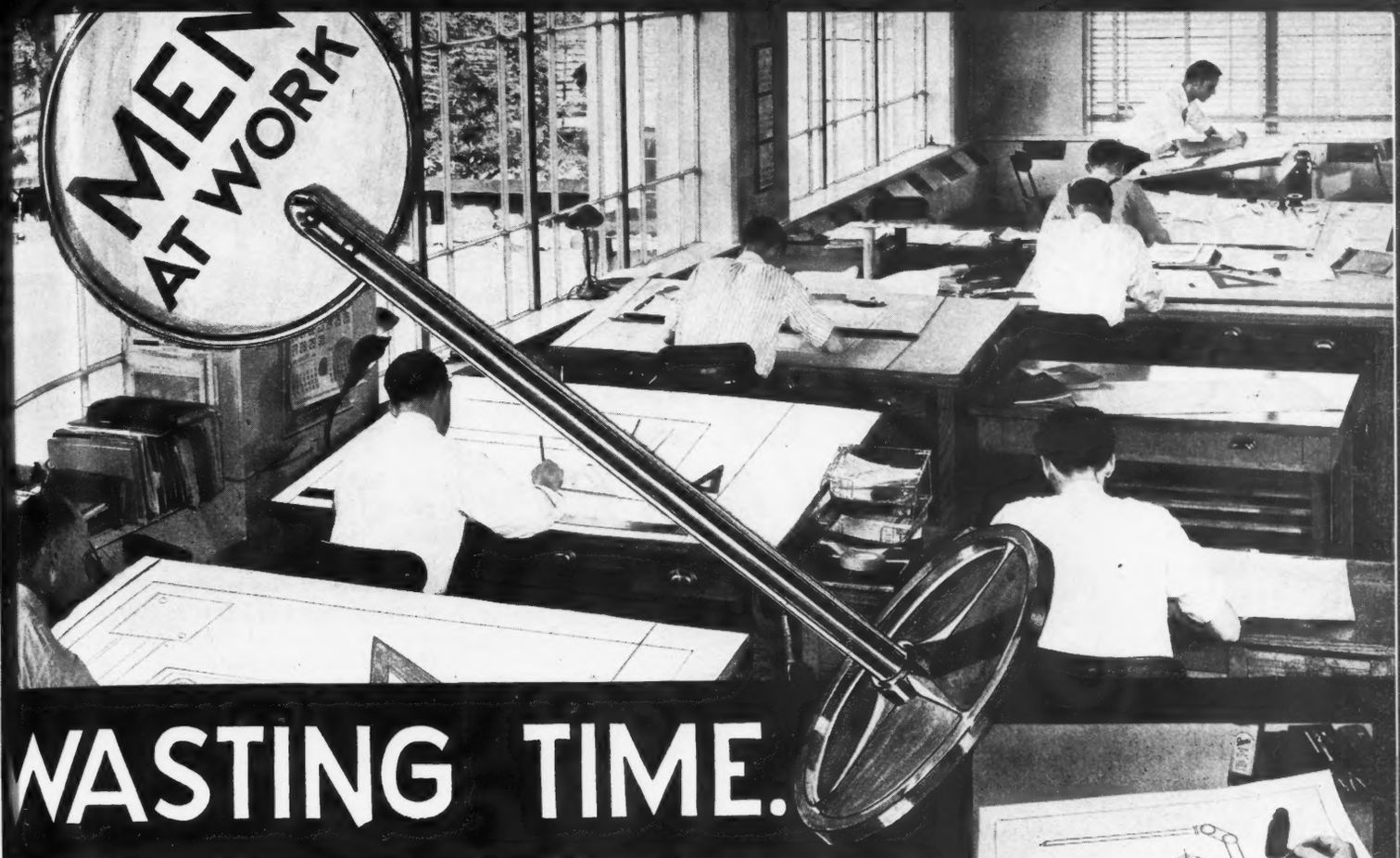
FOR USE IN COATING fluorescent lamps, phosphor is said to produce more light and uses no cadium or lead. In the fluorescent lamp, phosphor's function is to transform invisible ultraviolet rays into visible light radiations. New phosphor, already being used in Westinghouse lamps, has been found to maintain high output in lamps, yet permits elimination of cadmium and lead, two materials essential in the war effort. *Westinghouse Electric & Mfg Co, East Pittsburgh, Pa.*

Oil Purifier

PORTABLE UNIT said to dehydrate and purify transformer oils efficiently that contain moisture and contamination. Blotter press of this unit effective for dehydrating or removing moisture, and Cranite in purifier will remove all organic acidity and oxidized material that has developed in service, according to maker. Removal of moisture and all other contamination restores oil to its original operating efficiency, it is claimed. Complete transformer oil unit consists of filter, pump, strainer, relief valve, pressure gage, air bell, motor, piping, truck purifier, hoist for changing refills, and drying oven. Portable unit designed to be moved from unit to unit and can be loaded on a truck and moved out into the field. *Honan-Crane Corp, 200 Superior St, Lebanon, Ind.*

Pipe Clamp

STYLE 77A BAND CLAMP used for quick repair of small pinholes, leaks and splits in straight runs of pipe. Clamp made up of heavy one-piece steel band of circular, split construction, with a riveted bolt lug at each end. Track-head bolt pulls ends securely. To install, clamp is sprung apart until it can be slipped around pipe and over gasket or packing; then it is bolted up to make a



WASTING TIME.

DOES THIS HAPPEN IN YOUR DRAFTING ROOM?

These draftsmen are busy making changes in the design of a fighter plane . . . and there isn't a day dream in the crowd. But they are wasting time—valuable time which could be saved with the Ozalid Process.

With an Ozalid whiteprint machine they could make transparent prints of the original drawings . . . apply Ozalid Corrector Fluid to the obsolete lines and then draw in the new designs. Thus, they could have new "originals" without tedious retracing . . . without the wasteful tie-ups encountered in altering Van Dykes.

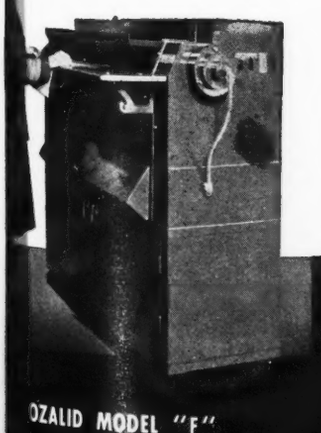
Ozalid transparent and standard whiteprints are produced in two quick steps—*Exposure and Dry Development*. And because of DRY DEVELOPMENT—an Ozalid whiteprint machine is radically different from blue print equipment which requires liquid baths, driers, permanent plumbing connections and much floor space.

Ozalid's wide variety of sensitized materials may be used in the whiteprint machines built for major, medium or small print production—thus, everyone can produce prints on foil, cloth, or air mail weight paper—prints which will have blue, black, maroon or sepia lines on a white background.

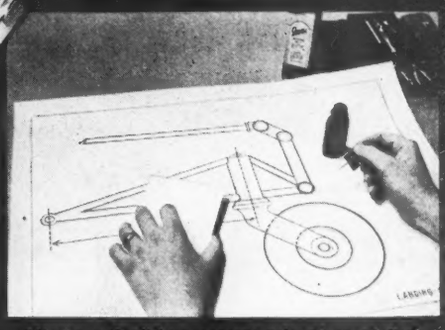
If you are not already using the Ozalid Process . . . but are changing the design of your drawings . . . you are wasting time and labor. Save these essentials in war production!

Write for new catalog "Simplified Printmaking" which explains all the advantages of the Ozalid Process.

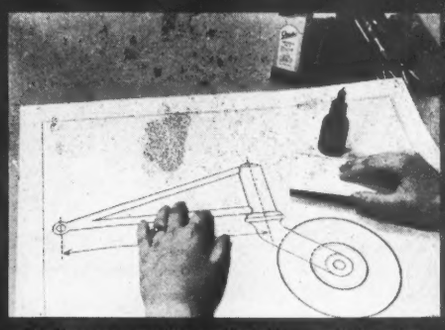
SPECIFY Ozalid WHITEPRINTS



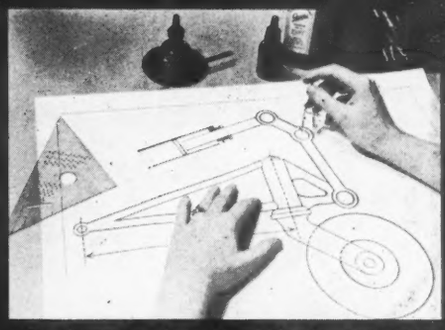
OZALID MODEL "F"



This is an Ozalid transparent print of an original tracing. The draftsman is applying corrector fluid to that part of the design which is to be changed.



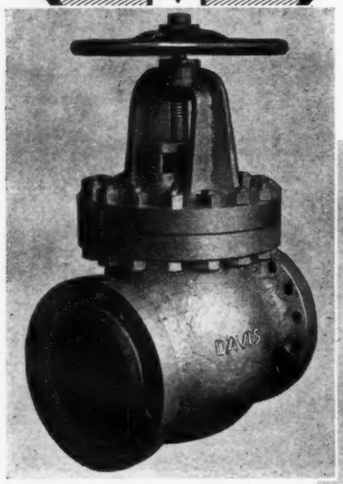
The lines are quickly eradicated . . . and the print is dried with a desk blotter. Only that part which will be the same in the "new" design remains.

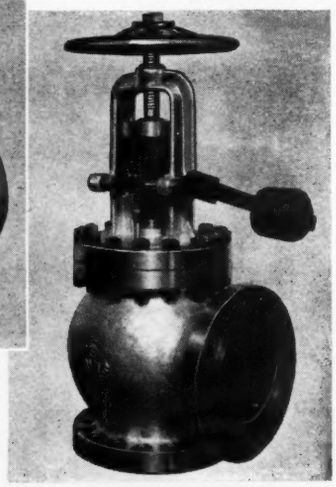


The changes are drawn in . . . and a "new" original is ready to produce subsequent prints.

OZALID PRODUCTS DIVISION
GENERAL ANILINE & FILM CORPORATION
JOHNSON CITY, N. Y.
OZALID IN CANADA - HUGHES OWENS CO. LTD., MONTREAL

BOILER STOP-AND-CHECK VALVES





ABOVE—No. 102

RIGHT—No. 101

• CATALOGS ON REQUEST! •

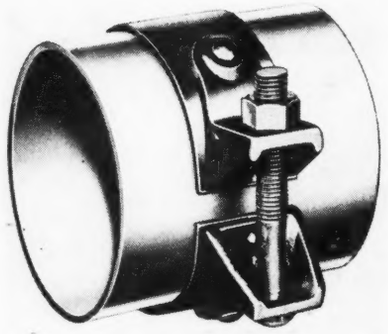
DAVIS Stop-and-Check Valves have long been "*Standard for Safety*" in boiler plants throughout the nation.

NO. 101—Designed particularly for finest high pressure, heavy duty steam plants. Features an external oil dash pot and counter-weighted lever which can be moved by hand at any time to test the valve and also provides visible action. Inside, it is as clean and simple as a streamlined globe valve.

NO. 102—The popular valve for general service. Features an ingenious valve design with internal steam dash pot eliminating any tendency to chatter.

BOTH TYPES are available in a complete range of sizes. Globe, angle, corner or elbow body patterns. Semi-steel, carbon steel, or alloy steel bodies with suitable trim for any pressure and temperature. For prompt service, send an outline of your requirements to the DAVIS REGULATOR CO., 2540 S. Washtenaw Ave., Chicago, Ill.

DAVIS REGULATOR COMPANY



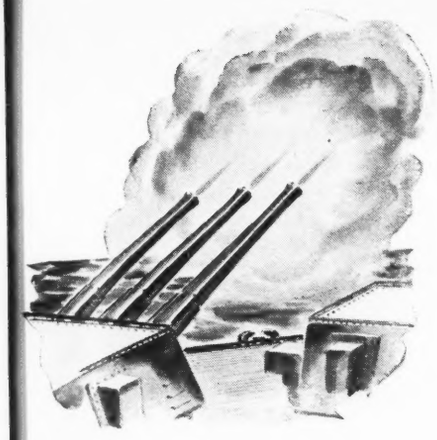
firm, leak-proof repair. A special cone gasket (furnished when specified) has two molded rubber tabs which aid in positioning the gasket over pinhole or leak. Range of sizes includes all standard pipes from 1 in I D to 26 O D, and cast-iron and special size pipe. *Dresser Mfg Co, Bradford, Pa.*

Wire Rope Slings

"FLATWEAVE" non-spiraling sling developed specifically for lifting light and medium loads where legs choke load or sling comes in direct contact with load being lifted. "Flatweave" body is made up of six separate ropes. Two pairs of two ropes each are laid in opposite directions. These are united into a finished sling unit by two single tie ropes which alternately pass back and forth around one pair and then the other in a spiral figure 8. "Flatweave" pattern develops a high strength efficiency equalled by the high efficiency of specially constructed loops. Same safe loads can therefore be allowed with loops as with socketed ends. Loops, which can be used as chokers without the use of thimbles, easily slip over crane hooks or lifting lugs.—*John A Roebling's Sons Co, Trenton, N. J.*

Oil Switch

NOVALUX CONTROLLER said to assure increased protection against electrical breakdown on high-voltage circuits. This



More Power to 'Em!

Translating the high speed revolutions of a motor into the slow driving power of an ammunition hoist means a slowdown in speed—an increase in power.

Foote Bros. speed reducers have the rugged construction, the simplicity, the high efficiency and smoothness of operation that have won their acceptance by the Navy on our new battleships.

The lessons learned in the laboratory of war—the refinements made necessary in reduced size, reduced weight, increased efficiency and dependability, all spell new and improved speed reducers for industrial applications such as conveyors, elevators, agitators, mixers, dryers, kilns, hoists and mills when the war is over.

The plant of Foote Bros. Gear and Machine Corporation is today a huge laboratory developing new techniques in engineering and new techniques in producing better gears and better speed reducers. These developments promise peacetime gears and speed reducers that will enable American manufacturers to provide better machines at lower cost.

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In War Time, It's . . .

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★ **Achieve design flexibility, conserve vital materials, speed conversion, assembly and production by utilizing flexible metal connections—specifically..**

REX *Flexible* METAL HOSE

Units Shown are Typical Vari-formed Assemblies.

The many production types of REX Flexible Metal Hose offer the widest range of adaptability—for simplifying re-design problems where space limitations and flexibility are imperative—for conserving more critical materials—for solving every kind of fluid and gas handling problem.

REX Flexible Metal Hose speeds manufacture by facilitating assembly. It can be bent to position or "snaked" into place and coupled in a fraction of the time required to fit multi-plane pipe connection. Easily attached fittings for every requirement. REX Flexible Metal Hose withstands severe flexing and vibration. All in the interest of war time economy.

FLEXPEDITE *YOUR* PRODUCTION

Write for data and engineering recommendations on specific problems involving flexible connections.

REX-WELD Corrugated Flexible Metal Hose • REX-TUBE Interlocked Flexible Metal Hose
REX-FLEX Stainless Steel Flexible Tubing • AVIOFLEX Oil Line Hose • CELLU-LINED Hydraulic Hose

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CHICAGO METAL HOSE CORPORATION

General Offices: MAYWOOD, ILLINOIS

Factories: Maywood and Elgin, Ill.

solenoid-operated oil switch can be used with constant-current transformers energized from distribution systems up to 7620 volts, and has 15-kv class insulations as specified by ASA Insulation Standards for Transformers. Regulators and Reactors. It was designed primarily for use on protective lighting circuits served from distribution systems operating at voltages up to 7620/13,200 Y. *General Electric Co, Schenectady, N. Y.*

Engineers Books

(*Continued from page* 134)

and batteries. The highly practical treatment of the previous edition has been retained in the new one so that the book is of equal value to the electrician with little technical training as to the engineer.

Standards

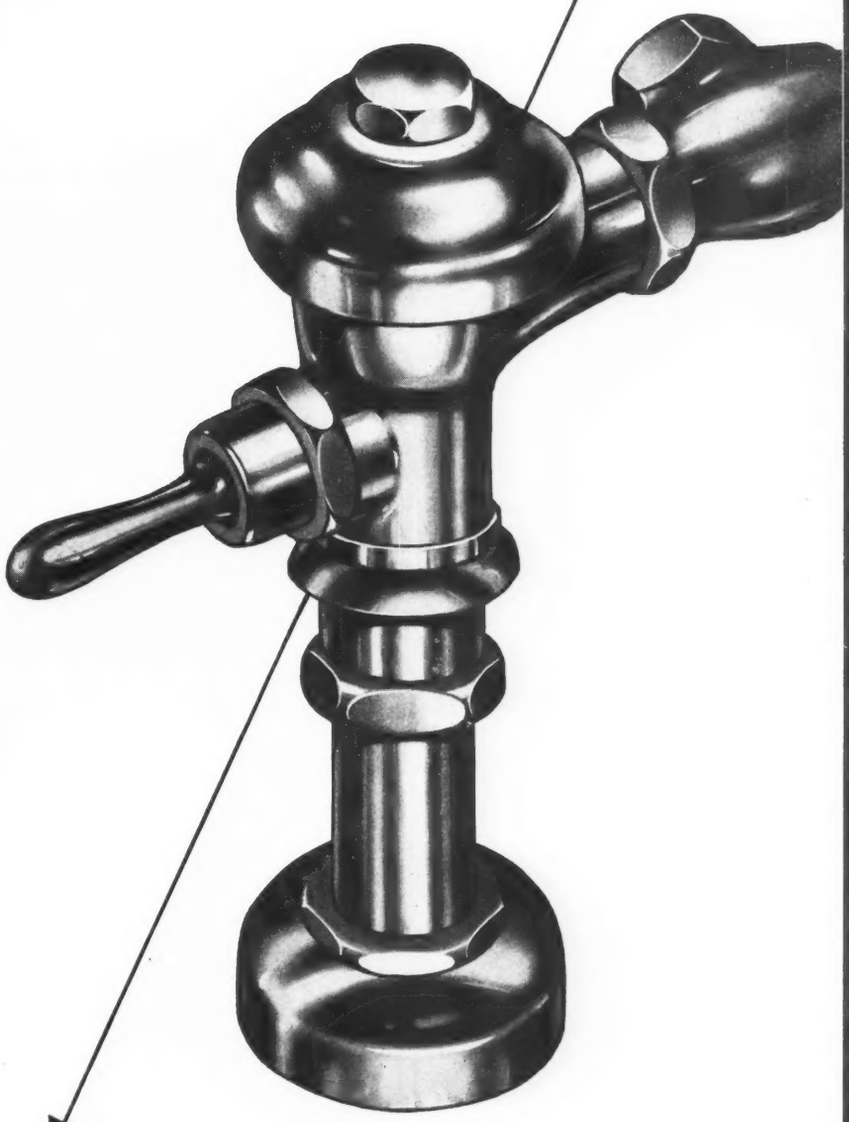
TRANSFORMER STANDARDS — (Eighth Edition—1942). *Published by National Electrical Manufacturers' Association, 155 E 44th St, New York, N. Y. 69 pages, 8½ x 10½ in., stiff-paper binding. Price $3.00.*

Published as a revised edition of the Transformer Standards, No. 42–73, this edition supersedes the handbook of 1932. The first section of the book is devoted to general standards dealing with principles on which temperature limits are based in rating of electrical machinery and apparatus. Other sections contain transformer ratings, performance and manufacturing standards and information on lead markings and connections for constant-potential transformers. Standards for single-phase pole-type distribution transformers are included in addition to definitions and comprehensive index.

POWER SWITCHGEAR ASSEMBLIES STANDARDS—1942. *Published by National Electrical Manufacturers' Association, 155 E 44th St, New York, N. Y. 65 pages, 8½ x 10½ in. stiff-paper binding. Price $3.25.*

These standards, No. 42–72, are a revision of the Power-Switchboard Standards of 1937. These new standards cover assemblies of switchgear devices such as switches, interrupting devices, control, metering, protective and regulating equipment with associated interconnections and supporting structures. General manufacturing and application standards applying to switchgear devices are contained in one section. Standards for indoor metalclad switchgear, removable-truck switchgear, in-

They rarely need attention... BUT they deserve it now!



Very rarely does your adding machine or your Sloan Flush Valve need attention. But both are mechanical instruments and so, both *will* wear. That being the case (if you couldn't get another) you would be careful to take care of the one you have.

Take care of your Sloan Flush Valves. Every material entering into their manufacture is on the critical list. Conserve vital metals by proper maintenance.

Call in your master plumber today and have him check over your Sloan Flush Valves. Such a check-up will result in two things: (a) put the valves that *do* need attention in A-1 condition, and (b) give you the assurance that your Sloan Flush Valves are as good as new—ready for more years of trouble-free, water-saving service under all conditions.

SLOAN VALVE COMPANY

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SLOAN FLUSH VALVES

DIRTY BOILER TUBES ARE ENEMY SABOTEURS

Now, when boilers must develop every pound of steam possible from the fuel burned, it is imperative that tubes be cleaned *cleaner* and *faster* than ever before. Dirty boiler tubes slow up production of essential war materials just as surely as enemy saboteurs working on the production line.

Wilson Tube Cleaners, cutter heads, brushes or other accessories clean *any* mechanically cleanable ferrous or non-ferrous straight or curved tubes of large or small diameter *better* and *faster*. Their use *reduces* tube cleaning time and *increases* steam pressure and plant production.

Every Wilson Tube Cleaner and accessory is especially designed and built for a specific job of tube cleaning. That's why it does its work so remarkably well and with such unusual speed. You can get the *proper* tube cleaning to meet the exact tube conditions existing in *your* plant. Write for the name of our representative nearest to you or ask for a copy of our NEW forty-page catalog which fully describes and illustrates the complete line of Wilson tube cleaning equipment.

INVEST IN AMERICA! BUY WAR BONDS AND STAMPS!

THOMAS C. WILSON, Inc.
PIPE AND TUBE CLEANERS EXCLUSIVELY
47-28 37th Street Long Island City, N. Y.

Cuts your gasket costs in half

The most remarkable tool ever invented

Write for booklet

THE ALLPAX GASKET CUTTER
Manufactured by
THE ALLPAX COMPANY, INC.
Distributors everywhere *Mamaroneck, N. Y.*

door cubicle switchgear, outdoor switch houses, enclosed low-voltage air-circuit-breaker switchgear (up to 600 volts ac and up to 750 volts dc) and automatic switchgear are specifically covered. Also included are definitions, graphical symbols, and information pertaining to standard equipment.

ENCLOSED-SWITCH STANDARDS — 1942. *Published by National Electric Manufacturers Association, 155 E 44th St., New York, N. Y. 19 pages, 8½ x 10½ in., stiff-paper binding. Price $.60.*

Published for the first time this new standard includes general, performance, rating and marking standards for air-break switches having their current-carrying parts enclosed in metal cases and enclosed switches with or without provision for plug or cartridge enclosed fuses. The section devoted to general standards covers switch types, enclosures and enclosure specifications, operating mechanisms and spacings, wiring space and terminals. The section on performance standards includes temperature limitations, overloads, endurance and dielectric-strength tests. The part devoted to ratings deals with voltage, current and horsepower ratings of fusible enclosed switches.

Merchant Marine

MODERN MARINE ENGINEER'S MANUAL, VOLUME I. *Alan Osbourne, Editor in Chief, U. S. Maritime Commission. Published by Cornell Maritime Press, 350 West 23rd St, New York, N. Y. 1600 pages, 5 x 7 in., illustrated. Price $6.*

A textbook on marine engineering, simply written that explains design and operation of modern marine equipment. Much basic theory is included such as mathematics, geometry and trigonometry, properties of engineering materials, thermodynamics, and principles of combustion, practically expressed for ship operators. Other chapters on pipe, fittings and packing, boilers and boiler operation, reciprocating engines, marine steam turbines, bearings and shafting, lubrication, condensers and pumps cover all principal marine machinery.

An example of the completeness of explanatory information can be found in the chapter on thermodynamics which discusses theory and practice of boiler water conditioning, operation of evaporators and other kindred problems of the steam cycle. Questions at the end of each chapter self-test the reader preparing for examinations. This book is in itself an excellent re-

If anyone can lick *your* problem

YOUR ELECTRUNITE DISTRIBUTOR CAN

Maybe we make it seem too easy. It isn't always a "snap" for him to solve tube supply problems these days—but he exerts every effort to find an answer, even though it may take hours of studying customers' needs, juggling stocks and utilizing his broad knowledge and experience.

Plants engaged in war production need more tubes for new boilers, condensers and heat exchangers—more tubes for the retubing of old heat transfer units. Railroads must have more tubes to meet heavier transportation demands. The Navy and merchant ship builders require more tubes for stationary and express boilers. Mill shipments to your ELECTRUNITE Distributor may be slower. Even with this increased demand, he has been able to furnish tubes for important rush jobs—and he will continue to do so to the utmost of his ability.

Get to know your ELECTRUNITE Distributor. Tell him your expected needs for the future so that he may anticipate what demands will be placed upon his stocks. Give him complete details on how the tubes will be used. Be sure that he has your preference rating or its extension. And, most important of all, give him all the time possible.

Cooperate with your ELECTRUNITE Distributor. If anyone can lick your problem, he can.

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Republic

ELECTRUNITE

Reg. U. S. Pat. Off.

ELECTRIC RESISTANCE WELDED BOILER, CONDENSER AND HEAT EXCHANGER TUBES

REPUBLIC STEEL PRODUCTION FOR VICTORY

YARWAY
INVOLUTE
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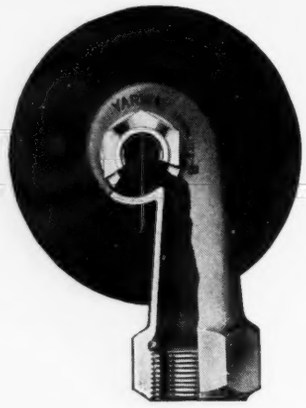
NOZZLES



Unique Yarway Involute design.

No internal parts or vanes to clog or erode.

Unobstructed flow gives minimum loss of head.

Finely divided spray cone provides rapid cooling.

Renewable orifices adapt nozzles for any service.

Installations total more than 5 million gallons per minute in water cooling and air conditioning service.

Made in both cast and bar-stock types. All sizes from ¼ in. to 2½ in. Write for Catalog N-615.

YARNALL-WARING COMPANY
100 Mermaid Ave. Philadelphia

fresher course for marine men preparing to return to maritime service.

Heat Engineering

PRINCIPLES OF HEAT ENGINEERING (1942). *By Neil P Bailey, Research Laboratory, General Electric Co. Published by John Wiley & Sons, 440 Fourth Ave, New York, N. Y. 264 pages 6 x 9 in. Price $2.75.*

A book this reviewer would choose to teach thermodynamics to students of college grade that were not too much afraid of an integral sign. Mr. Bailey not only hits the fine-pointed nails of thermodynamics on the head accurately and concisely but illustrates each point with the kind of example power-plant designers meet in actual practice. For class study work, he includes 40 pages of excellent and searching problems that would test anyone's grasp of the subject. This is a better book for class work, however, than for reference or self-study. SAT

Submarine Warfare

WHAT THE CITIZEN SHOULD KNOW ABOUT SUBMARINE WARFARE—1942. *By David O Woodbury. Published by W W Norton, 70 Fifth Ave, New York, N. Y. Drawings by Louis H Ruyl, diagrams by the author. 227 pages, 6x9 in. Cloth bound. Price $2.50.*

Author of "Conquest of the Colorado" and the "Glass Giant of Palomar", Mr Woodbury, a former editor of POWER, has handled this subject with all of the deftness and conciseness of the two previous books mentioned.

Truly telling the facts about submarine warfare which the average citizen should know without revealing military secrets, the author begins with a brief history of the very early developments of the submarine as it emerged from the early times. The German U-boat challenge during World War I in 1914 to 1917 is covered, together with the Allied answer.

The submarine as a unit is taken, section by section, and expertly described in detail, from the hull to the torpedo, including the engine room, battery room, officers' and crew's quarters and auxiliary compartments.

Bringing the subject up to date, with a description of the U. S. Submarine School, the author follows through with accounts of the German attacks in 1939-40, the story of the battle of the Atlantic, and the beginning of the war with America, on December 7, 1941. A brief summation of the "Battle of

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A DIGEST OF
28
essential maintenance jobs generally performed in factories and mills and on which Oakite materials are being successfully used to save time, money and effort.

It's NEW! It's TIMELY... tells how 28 essential power plant maintenance jobs can be handled EASIER and FASTER!

War conditions are multiplying maintenance problems of every power plant, central station and public service company. Here in this Digest you will find data on 28 different jobs, each one based on the successful experience of many plants. On each is outlined the method followed, the Oakite material used, the advantages gained, the time saved.

You will have many of these maintenance jobs to do in your plant. Here is your opportunity to benefit by what others have discovered to speed-up this essential work and increase efficiency in handling these jobs.

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Time is at a premium these critical days. This Oakite Digest points out proved ways to save it and conserve man-hours for other work. Address us on your business letterhead and your FREE copy will go forward immediately. Send for it today!

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23 Thames Street, New York, N. Y.
Representatives in All Principal Cities of the United States and Canada.

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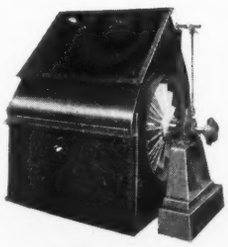
Specialized cleaning
MATERIALS & METHODS FOR EVERY CLEANING REQUIREMENT

Engineering and Product Experience That Goes Back to World War One

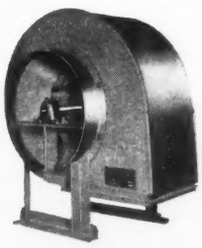
New American cargo ships and new American ships of war — hundreds of them are "coming through" equipped with Clarage Fans which provide the necessary ship ventilation, cooling, mechanical draft, etc. Builders find in Clarage a source of supply DEPENDABLE as to engineering, delivery and completed product.

And no wonder! For Clarage experience in this specialized field of air-handling goes back to World War One when, as now in World War Two, Clarage Fans served in the vital industrial plants and on the vital ships which helped produce Victory.

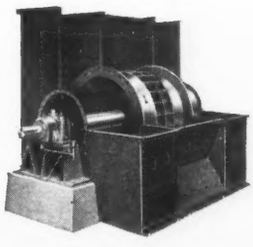
If you are engaged in work essential to the emergency, and require fans or blowers for any purpose, our facilities can prove of great help. We invite you to make use of them!



FORCED DRAFT



VENTILATION



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America" follows, together with American combat methods, results so far and lineup of world submarine forces.

Hydraulics

HANDBOOK OF APPLIED HYDRAULICS (First Edition — 1942). *Editor-in-Chief Calvin Victor Davis, Project Engineer, Fontana Dam, Tennessee Valley Authority and Lecturer in Hydraulic Engineering, University of Tennessee. Published by McGraw-Hill Book Co, 330 W 42nd St, New York, N. Y. 1084 pages, 6x9 in., 645 illustrations; 188 tables; semi-flexible binding. Price $7.50.*

Within the last 20 years tremendous advances have been made in the design and construction of hydraulic developments. Some of our most important dams, hydroelectric plants, aqueducts, pumping plants and other hydraulic structures have been designed and built during this period. This book, which has been written by its editor in chief and 17 other practicing hydraulic engineers and specialists prominently associated with recent advances presents the fundamental principles basic to each sub-division of hydraulic engineering and then demonstrates the practical applications of these principles by examples drawn from records of recently constructed projects. Over 60% of the space is devoted to those subjects connected with river regulation and hydroelectric developments and pumping plants. The remainder treats of water supply and treatment, sewage systems, irrigation and drainage with a closing chapter on the use of several types of hydraulic models and their construction. General formulas, tables and diagrams more or less common to each of the 23 sections in the book are summarized as a convenient reference in the first section, and special application of hydraulics are set forth in the section where they relate. As a handbook intended to serve both hydraulic engineers and engineering students the treatment is very practical. To the engineer this book furnishes practical reference data for the planning and design of modern hydraulic structures and for the student a practical text on hydrology, water supply, sewage, water power, hydraulic structures and other related subjects.

Mechanics

ENGINEERING MECHANICS (Second Edition, 1942). *By Frank L Brown, Professor of applied mechanics, University of Kansas. Published by John Wiley & Sons, 440 Fourth Ave, New*

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Man-Power

CHIKSAN Swing Joints in flexible lines or as end connections make it easier to couple and uncouple loading and unloading lines because they eliminate the time, labor and material required to fit up individual installations of rigid lines. One man can hook up to flexible lines with CHIKSAN Swing Joints in a fraction of the time required for two men to make connections with rigid fittings.

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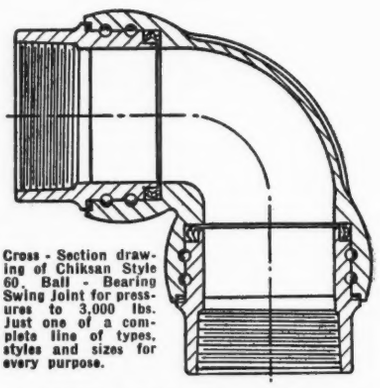

Cross - Section drawing of Chiksan Style 60, Ball - Bearing Swing Joint for pressures to 3,000 lbs. Just one of a complete line of types, styles and sizes for every purpose.

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Whether your flexible lines are ⅜" in diameter or 12" or larger, there is a CHIKSAN Ball-Bearing Swing Joint, or any desired combination of them, to give you all the flexibility you require. Supplied with threaded or flanged ends or bored for welding. Pack-off is so effective that CHIKSAN Swing Joints can be used either for suction or pressure lines. Special Packing Sets for handling liquids, gases or vapors injurious to rubber or certain synthetic compounds, or for underwater installations.

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KEEP 'EM CLEAN!

Fouled gun barrels cause inaccurate shooting and wasted shells. Fouled boiler tubes cut down boiler efficiency and waste fuel. America today has no place for either.

Your boilers may be of the latest high-pressure type with tubes everywhere, including long tubes with many bends. Or your boilers may be 20 years old. You *always* need tube cleaner equipment either for regular service or as insurance against scale accumulation.

Put the job of boiler tube cleaning up to Elliott-Lagonda equipment. We have motors to fit the tubes, go around the bends and make a quick job of cleaning. We have a selection of cutter heads, drills, brushes to match any tube cleaning need whether it be ½" tubes or 20" pipes.

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WILL WIN OUR WAR

An iron railing, an old boiler, a useless filing cabinet . . . these are the "war winners" lying around by the many thousands in the plants of American industry.

Follow up your first search for scrap by another one, more intensive. Overlook nothing . . . make sacrifices . . . dig deep. *Now* is the most critical time in your life . . . Now is the time to "give," to work, to win.

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A revised and enlarged text for college classes in engineering. The author states and explains principles in words, insofar as possible, rather than formulas, a technique that aids greatly in understanding the laws of forces, stress, acceleration and inertia. Of the many problems, answers are given to about half as aid to self-testing by the student.

Heat Engines

RIPPER'S HEAT ENGINES. *Revised by A T J Kersey. Published by Longmans, Green and Co, 55 Fifth Ave, New York, 337 pages, 5 x 7 in. Price $1.60.*

American edition of a British book that starts at the beginning of heat and power without formulas or mathematical discussion of theory. Discusses heat transfer, effects of heating and cooling, the formation of steam, reciprocating steam engines with their valves and governors, compound engines, boilers, fuels and combustion, furnaces, steam turbines and internal combustion engines. A book that can be read and understood by any adult.

Brief Reviews

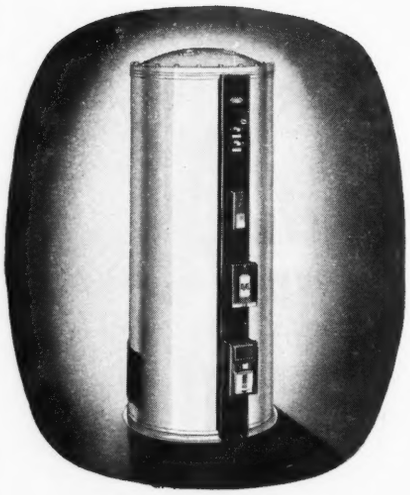
BIBLIOGRAPHY ON ELECTRICAL SAFETY 1930–1941. *Published by the American Institute of Electrical Engineers, 33 W 39th Street, New York, N. Y. 16 pages, 8½ x 11 in. $.25 to Institute members, $.50 to non-members.* Third bibliography of technical literature on this subject is designed to make available information of special interest at this time. A list of applicable standards, specifications and safety codes is also included. Items in this bibliography are divided into the following sections: "Electrical Accidents and Their Prevention," "Accident Prevention Methods," "Safety Codes and Standards," "Effects of Electric Shock," and "Resuscitation."

Power Lines

(*Continued from page* 132)

pulverized coal blown into the furnace. In April, 1941 the contract for the construction of the building to house the generating equipment was awarded and twelve months later the steel, brick and concrete structure was completed.

Pointing out that this was the third



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New valves and parts will be *increasingly* hard for even war-industry plants to get. Keep all your "working" valves in good condition and salvage as many of your old ones as possible.

With Dexter Valve Reseating Equipment any mechanic can not only reseat any make of valve or union *without taking it off the line* but can also quickly re-condition a large share of your *old* valves and unions. All seats and gates and discs will become pressure tight again.

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to Produce
MORE POWER

The new Roto Tube Cleaners give you power to produce more power because they enable you to descale your tubular equipment hours faster than was ever possible with old type cleaners. Coupled with the increased cleaning power of the new Roto motor is the time and labor-saving Roto operating air valve. This valve enables one man to operate the cleaner entirely by himself, and eliminates the delays caused by signalling a helper to turn the air on and and off between every tube cleaned. Now, more than ever, you need the fast, effective results which Roto can give you.

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This **UNIVERSAL** packing—of long, pliable, anti-friction metallic alloy strands—assures low cost, long life packing protection and easy application on any rod in good condition. "AMBEST"—available for all pressures and temperatures up to 550° F.—is recommended for pumps, compressors, engines, throttles and valve stems. All needs are supplied by one packing when you use "AMBEST."

"EUREKA"

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large steam generating unit to be placed in operation by the Niagara Hudson System within two years, Col Kelly stated that the system has, during this period, made available to the war effort more than one quarter million kilowatts of added power as a result of "long range engineering planning."

Because of the standardization during recent years on the part of industrial as well as commercial and residential consumers on the use of 60-cycle equipment, it was decided to generate this added power at that frequency.

OBITUARIES

GEORGE L WILLIAMS, 74, for 40 years an engineer at the Budlong Mfg Co, Cranston, R. I., until his retirement four years ago, died suddenly in that city on Sept 11. He was a native of Saylesville, R. I.

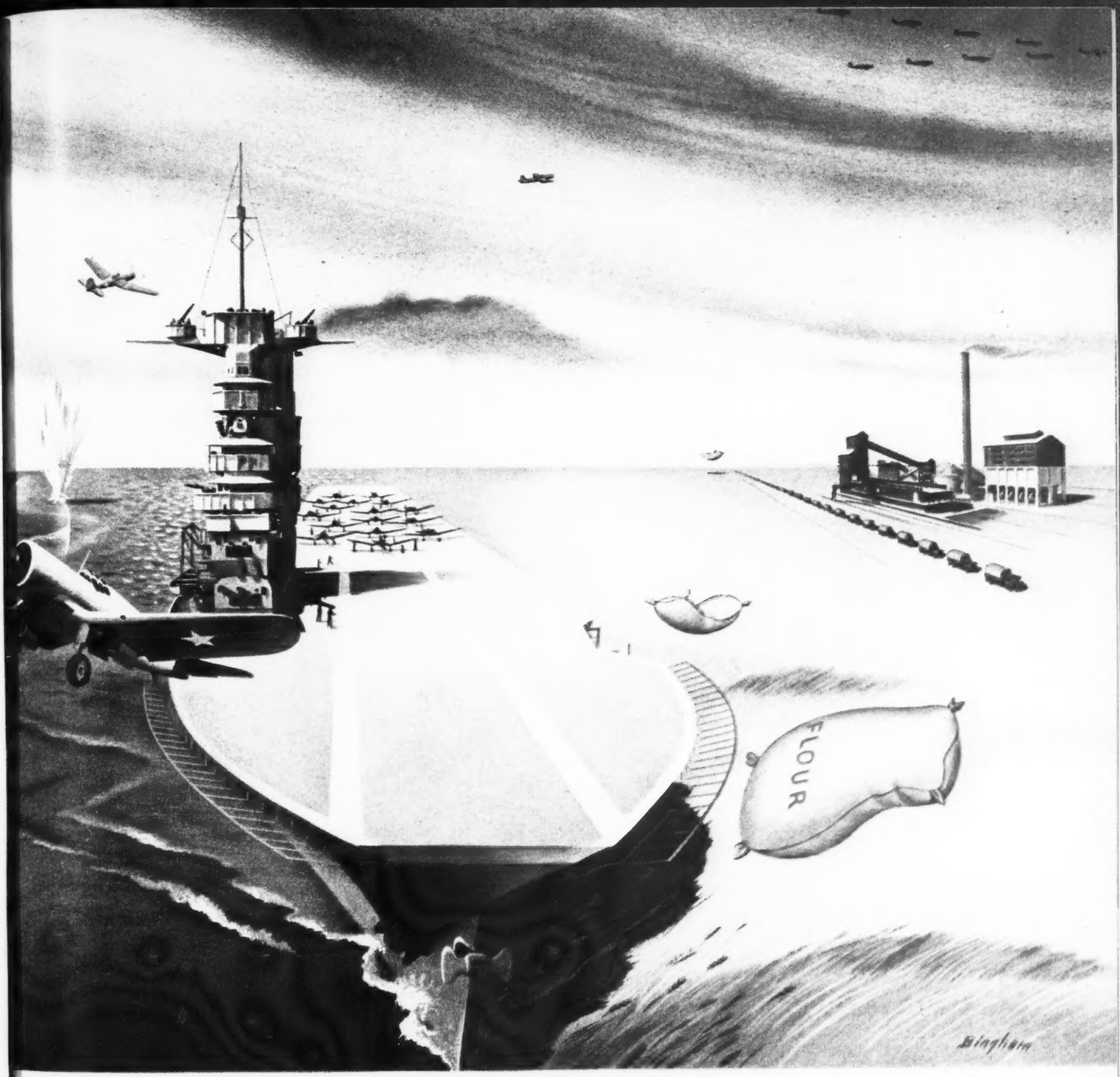
LOUIS B WALTHER, 71, for seven years steam engineer at the Middlesex County jail, Cambridge, Mass., and at one time engineer of the municipal pumping station at Provincetown, Mass., died at a Boston hospital on Sept 11.

ALFRED E SEELIG, president and general manager of the L J Wing Mfg Co. New York, N. Y., died Sept 13, 1942. after a long illness, at the age of 54. Mr Seelig has been associated with the L J Wing Mfg Co for 26 years. He was a member of the Society of Heating and Ventilating Engineers.

EDWARD W P SMITH, 56, consulting engineer for the Lincoln Electric Co, and a nationally known authority on arc welding, died Sept 19. Mr Smith was born in Cleveland and was graduated from Colorado College, Colorado

E W P Smith

Springs, Colo., with a degree in electrical engineering. Before joining Lincoln Electric as a tester, he had worked in the electrical inspection de-



An Army Travels on its Ammonium Sulfate

Did you think we were going to say "An army travels on its stomach?" Well, it's the same thing.

Many of the essential chemicals used by farmers in raising plants and animals are derived from coal.

One of the fundamental needs of the farm is nitrogen. It produces bigger yields and better qualities.

When the First World War started, the shortage of imported nitrogen made it difficult to get good fertilizers. Today, large supplies of nitrogen are obtained from ammonium sulfate recovered from the coal carbonized in Koppers coke ovens.

Koppers serves the farmer and the food industry in many other ways.

Fruits are often destroyed by diseases caused by fungi, or by dropping before ripe. Diseases of fruits are prevented by Koppers Flotation Sulfur. The premature dropping of unripe fruit is being prevented through the use of synthetic plant hormones made from naphthalene of which Koppers is a major producer.

Koppers built the first large American plant for recovery of ammonium thiocyanate, an essential raw material in the production of complex organic thiocyanates for insecticide manufacture.

Farmers control animal parasites with coal tar products . . . they get their products to market on roads built of coal tars . . . they prevent decay and destruction of wooden farm structures through the use of lumber pressure treated with Koppers creosote . . . they use Koppers American Hammered Piston Rings in many farm vehicles.—Koppers Co., Pittsburgh, Pa.

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KOPPERS

THE INDUSTRY THAT SERVES ALL INDUSTRY

Workers in our Bartlett Hayward Division are now privileged to wear the Navy "E" and Maritime "M" emblems.

Enlist that Scrap

... FOR THE DURATION

When you turn in your scrap *this month*, your obligation does not end. For the steel furnaces must run next month, too -- and the next -- and the next.

Steel production of eighty-five to ninety million tons of ingots a year calls for approximately 3,000,000 tons of scrap per month--about 750,000 tons a week--over 100,000 tons a day. Half of this comes from the industry itself, but the other half must come from the public.

Reduced to its simplest terms, if the steel industry is to produce steel at the rate and in the volume that our war program demands, then America must collect nearly ONE POUND OF SCRAP EVERY DAY for each man, woman and child in the nation.

You, the reader of this publication, have this clear, individual obligation: As a patriotic citizen and a responsible executive or workman, you must act to the extent of your ability to KEEP SCRAP FLOWING to the steel plants.

Do your part to enlist scrap for the duration.

WHY NOT TRY THIS YOUNGSTOWN IDEA?

Red-white-and-blue barrels like this stand on important street corners, in both business and residential districts of Youngstown, Ohio. They provide a convenient and tangible means of getting action from citizens, young and old, who are bombarded daily with radio, newspaper, magazine and other advertising urging them to turn in scrap.

That this is an effective idea is proven by the fact that two city trucks are kept busy every day, collecting scrap from these barrels and answering calls from householders who have other scrap to contribute, too large to go into the barrels. Perhaps YOUR city can try this plan, too.

This Company joins in the counter attack against accidents by subscribing to the National Safety Council's War Production Fund to Conserve Manpower.

QUALITY TRADE MARK YOUNGSTOWN SERVICE

THE YOUNGSTOWN SHEET AND TUBE COMPANY
YOUNGSTOWN, OHIO

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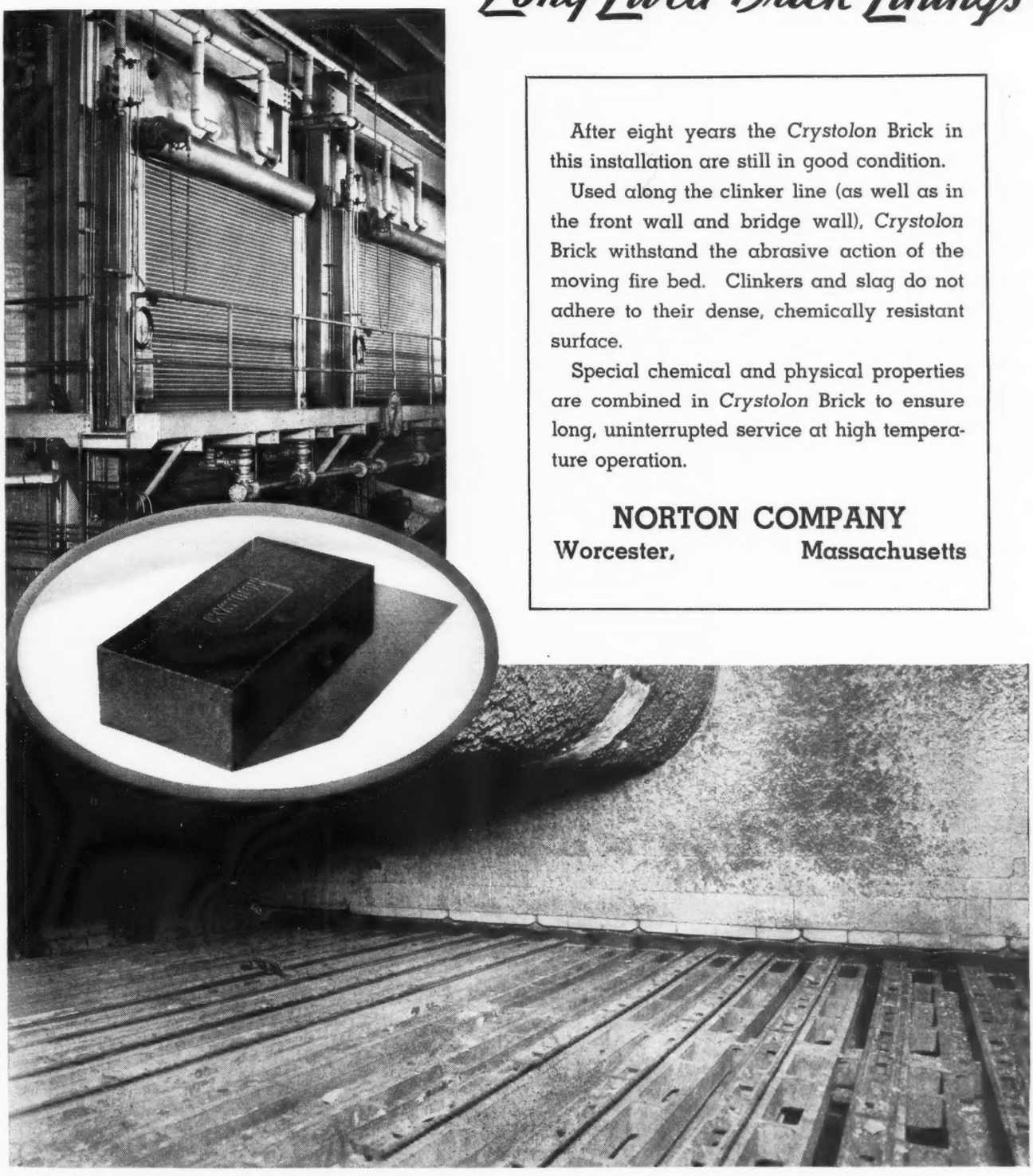

After eight years the *Crystolon* Brick in this installation are still in good condition.

Used along the clinker line (as well as in the front wall and bridge wall), *Crystolon* Brick withstand the abrasive action of the moving fire bed. Clinkers and slag do not adhere to their dense, chemically resistant surface.

Special chemical and physical properties are combined in *Crystolon* Brick to ensure long, uninterrupted service at high temperature operation.

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SPEEDILY REPAIRED with SMOOTH-ON

Replacing a burst valve body under wartime conditions may mean a lengthy delay with loss of valuable production time. However, SMOOTH-ON No. 1 permits a quick, effective, and lasting repair, without taking the valve off the line.

SMOOTH-ON will also successfully repair cracks in cast shells of pumps, heat exchangers, engines, compressors or any other apparatus. SMOOTH-ON is equally effective for stopping leaks at joints, seams, rivets and on pipe lines. This many-purpose iron repair cement, proven helpful in emergency repairs and routine maintenance jobs for 47 years, is today more of a plant necessity than ever before. Buy a can and keep it handy for the trouble jobs that may occur at any time.

Get Smooth-On in 7-oz., 1-lb. and 5-lb. cans or 25-lb., 100-lb. kegs from your supply house, or if necessary from us. *For your protection, insist on Smooth-On, used by engineers and repair men since 1895.*

40-Page Repair Handbook . . . . FREE

Describes hundreds of practical repairs that save time, effort, and money. An invaluable aid in keeping machinery in operation and avoiding loss of production time. Just fill in and return the coupon for your FREE copy.

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partment of the City of Cleveland, and for the Westinghouse Electric & Mfg Co, in Pittsburgh, Pa.

PERSONALS

CHARLES E WILSON, president of the General Electric Co, has been appointed vice-chairman of the War Production Board, as announced by Chairman Donald M Nelson. In this post Mr Wilson will also serve as chairman of the newly-organized production executive committee and will exercise the powers of the chairman of the War Production Board in seeing to it that production programs are met. Mr Wilson has been the president of General Electric since 1940. Born in New York City in 1886, he has been in the electrical industry since 1899, when he went to work with the Sprague Electric Co in New York. In 1918, when the Sprague Electric Co was absorbed by General Electric, he became assistant general superintendent of the General Electric Works at Maspeth, L. I., and New Kensington, Pa. In 1928 he became assistant to the vice-president, advancing to vice-president in 1930, and to executive vice-president in 1939.

HILAND G BATCHELLER, president of the Allegheny-Ludlum Steel Corp, Pittsburgh, has been appointed a head of the WPB Iron and Steel Branch. Mr Batcheller is a graduate of Wesleyan University and served as a consultant in the Priorities Division of the Office of Production Management in 1941.

WALTER L MAXON has been appointed manager of the Allis-Chalmers Mfg Co's crushing cement and mining machinery department. Mr Maxon succeeds Herman Schifflin, dean of the country's cement machinery salesmen, who is retiring.

ROBERT C SESSIONS, of the consulting engineering firm of Sessions & Sessions, Cleveland, Ohio, has been appointed chief engineer of the Brown Fintube Co, Elyria, Ohio. Mr. Sessions, who was graduated from Worcester Polytechnic Institute in 1919 in Electrical Engineering, is a member of the ASME and AIEE. The consulting engineering firm is being continued in the Rockefeller Bld, Cleveland, under the active direction of F L Sessions, senior partner.

WARREN K LEE has been elected president of the Wilkening Mfg Co, Philadelphia, Pa. Mr Lee has been

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The France Representatives listed below are packing experts. They are experienced in the solution of engine, pump and compressor packing problems that have to do with pressure, temperature, friction and lubrication. They are good men to know well. Tear out this list or at least the number nearest you. Keep it handy. Use it to your advantage.

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LOS ANGELES
A. C. Elder, 2714 So. Hill St. — PRospect 9529

NEW ORLEANS
R. M. Shad, 7738 Hampson St. — WAL 4785

CHICAGO
J. H. McKenna, 1346 Washington Blvd. — HAYmarket 6621

SEATTLE
W. H. Rober, 24 W. Connecticut St. — ELliott 6644

MID-CONTINENT
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METAL PACKING

Use a Cable that Does the Job

WITHOUT

WASTING COPPER

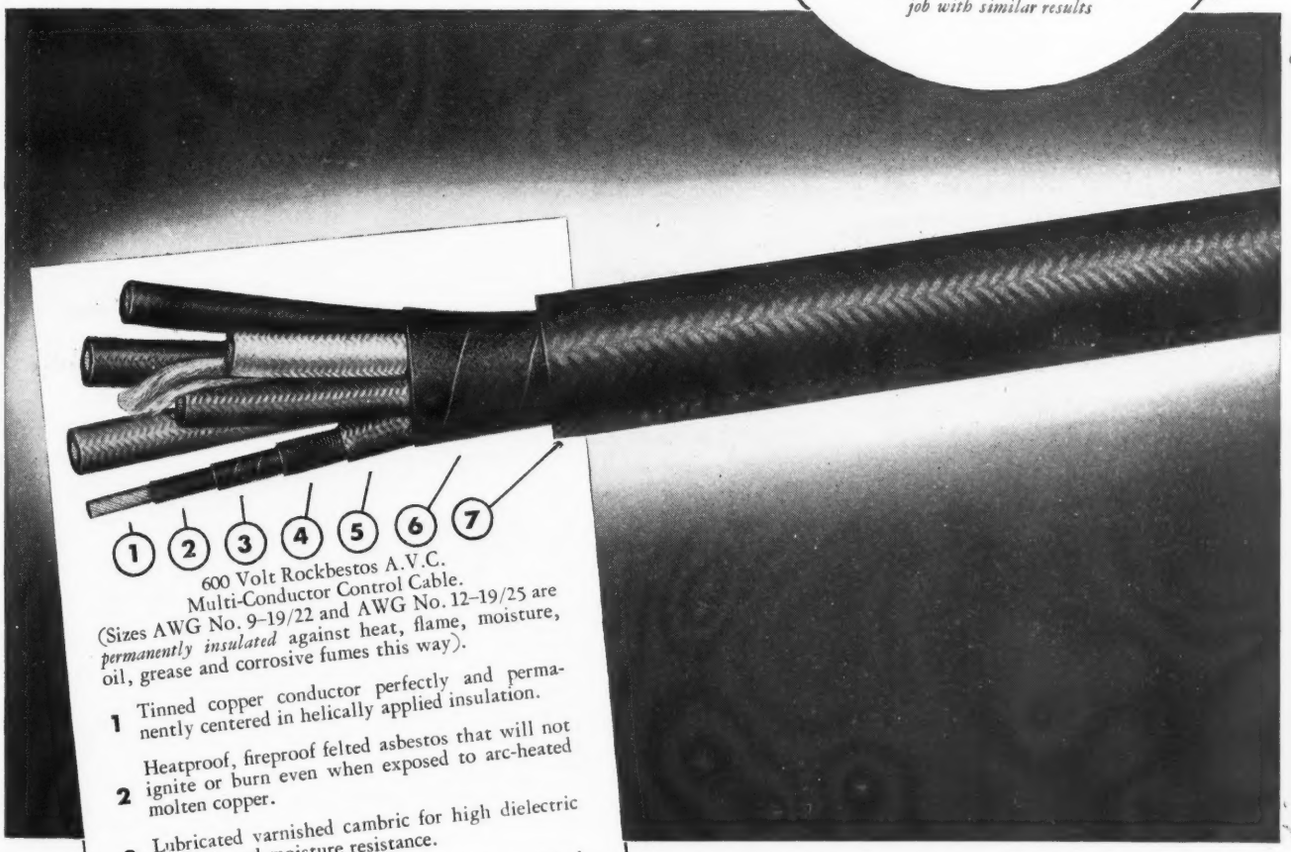
You can save copper *when you order* wire and cable; *pounds*, perhaps *hundreds of pounds*, probably as much as *a ton or more*, —you can help spread our rapidly diminishing copper supply farther—and you can do it by specifying smaller conductors that will still be adequate for normal operating requirements.

To the right is but one example of what can and should be done more often to further copper conservation.

3806 LBS. OF COPPER SAVED ON A SINGLE JOB

A large mill had habitually bought Rockbestos A.V.C. Multi-Conductor Control Cable in size #9 AWG—19/22 strand conductors. They had a requirement for 16,000 ft. of 12 conductor cable. Our engineer asked, "Do you actually have to use a #9 conductor? Wouldn't #12—19/25 strand conductors amply carry your control circuit?" Customer investigated, decided he could make the change—result: a saving of 3806 pounds of copper while still having ample current carrying capacity.

Our engineers may be able to analyze your job with similar results



600 Volt Rockbestos A.V.C. Multi-Conductor Control Cable.
(Sizes AWG No. 9–19/22 and AWG No. 12–19/25 are *permanently insulated* against heat, flame, moisture, oil, grease and corrosive fumes this way).

1 Tinned copper conductor perfectly and permanently centered in helically applied insulation.

2 Heatproof, fireproof felted asbestos that will not ignite or burn even when exposed to arc-heated molten copper.

3 Lubricated varnished cambric for high dielectric strength and moisture resistance.

4 Another felted asbestos wall to seal the varnished cambric away from heat, flame and oxidation.

5 Color-coded cotton braid for easy circuit identification.

6 A wrapping of moisture-proof tape to bind the cabled conductors and jute filler together.

7 A tough, rugged asbestos braid impregnated with inert compounds that are resistant to heat, flame, moisture, oil, grease and corrosive fumes.

Copper can be saved safely on many jobs with Rockbestos A.V.C. (asbestos and varnished cambric insulated) Underwriters' Type AVA, and Rockbestos All-Asbestos, Underwriters' Type A1, wires and cables. Their heatproof, fireproof insulation in many instances gives you greater carrying capacity because it can be run hotter (Type AVA, 110°C.–230°F., Type A1, 125°–257°F., N.E.C. page 286). These constructions are resistant to heat and moisture, oil, grease, flame and corrosive fumes, will not bake brittle, bloom, burn or rot. For recommendations on your specific cases and samples write to Rockbestos Products Corporation, 871 Nicoll Street, New Haven, Connecticut.

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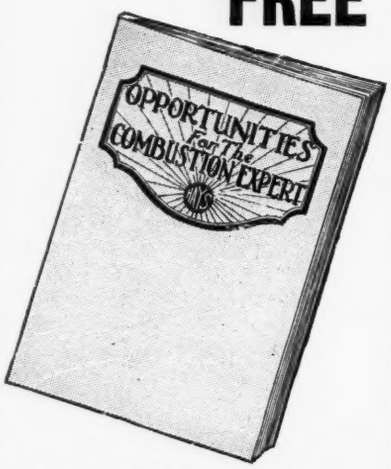

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a member of the Wilkening organization for over ten years.

ELBERT E HUSTED has been elected president of the Titeflex Metal Hose Co, Newark, N. J. Mr Husted first joined the Titeflex organization in 1924 and served for approximately one year in various departments of the factory. He then represented the company in a sales capacity, becoming its sales manager in 1930. In 1936 Mr Husted was made a vice-president, and in 1938 also became general manager of the company.

FRANK J KEVLIN has been appointed traffic manager of the Falk Corporation. Milwaukee, Wis. Mr Kevlin, who has been handling traffic work for Falk for a number of years, will continue in his jurisdiction over the traffic division, and in addition will act as manager of the shipping department.

O J SCHAEFER, manager of the municipal sales department, West Penn Power Co, has retired from active service. Mr Schaefer served with West Penn for 32 years, during the greater part of which time he was engaged in promotion and sales.

DR CHARLES W RIPPIE, formerly petroleum technologist for the Solvay Sales Corp. has joined the Petroleum Chemicals Department of the Organic Chemicals Division of Monsanto Chemical Co, St. Louis. Dr Rippie will handle technical sales work.

CARL N HAND, chemical engineer and retired plant manager of the rubber service department of Monsanto Chemical Co, died Sept 18 at Charleston, W. Va. He was 50 years of age. Mr Hand, with E J Smail, Jr, and C O North, founded the Rubber Service Laboratories at Akron, Ohio, in 1922, and was president and general manager until 1929 when Rubber Service became a part of Monsanto Chemical Co.

EARLE J MACHOLD was elected president and a director of the Niagara Hudson Power Corp, to succeed the late Alfred H Schoelkopf. Mr Machold has been closely identified with the operations of the Niagara Hudson System for the past twelve years as counsel for the companies.

BUSINESS ITEMS

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS announces that Harold V Coes. vice-president of Ford. Bacon

FIVE REASONS WHY YOU SHOULD USE PALMETTO PACKING

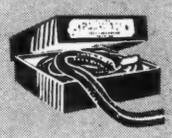
1. **Lasts longer because it doesn't dry out . . . every strand is impregnated with lubricant before braiding.**
2. **Doesn't score shafts . . . internal lubricant keeps Palmetto soft.**
3. **Resists wear . . . made from strong, high grade, long fibre asbestos.**
4. **Useful in emergencies . . . Palmetto special graphite lubricant resists most fluids.**
5. **More economical . . . costs less to use in the long run.**

WRITE FOR LITERATURE

GREENE, TWEED & COMPANY
Bronx Blvd. at 238th St., New York, N. Y.

TWISTED
For valve stems; each strand a perfect piece of lubricated packing.

BRAIDED
For rods and shafts; layer over layer construction insures uniformly even bearing surfaces.



PALMETTO
for steam, hot water, air. PALCO *for water.*
PELRO *for oils.* CUTNO *for alkalis.*
SUPERCUTNO *(blue asbestos) for acids.*
KLERO *for foods.*
SELF-LUBRICATING
PACKINGS

GUARD WELL
THE LIFE OF YOUR
V-BELT DRIVES
23 WAYS TO CONSERVE THE LIFE OF YOUR MULTIPLE V-BELT DRIVES
The MULTIPLE V-BELT DRIVE ASSOCIATION
MULTIPLE V-BELT DRIVE ASS'N

FREE ASSOCIATION BOOK TELLS HOW!

THEY'RE VITAL for VICTORY—those Multiple V-Belt Drives in the thousands of plants throughout the country turning out war materials to defeat the Axis. And, like every other product made of rubber — V-Belts are precious beyond price. Every premature belt-death means that rubber must be diverted from other essential uses. Conservation is a patriotic MUST.

To assist in the drive for saving rubber the Multiple V-Belt Drive Association has prepared a brief manual outlining 23 ways for increasing the useful life span of V-Belts. Every power user is urged to ask for this FREE book and apply its recommendations religiously. Clip the coupon and mail today.

TRADE MARK

The use of this emblem by an association member in connection with Multiple V-Belt Drives is your assurance of mechanical excellence . . . the result of cooperative engineering, research and experience.

MULTIPLE V-BELT DRIVE ASSOCIATION

140 SOUTH DEARBORN ST., CHICAGO

Multiple V-Belt Drive Association
140 S. Dearborn St., Chicago

Please send us a copy of your free book, "23 Ways to Conserve the Life of your Multiple V-Belt Drives."

Name.....

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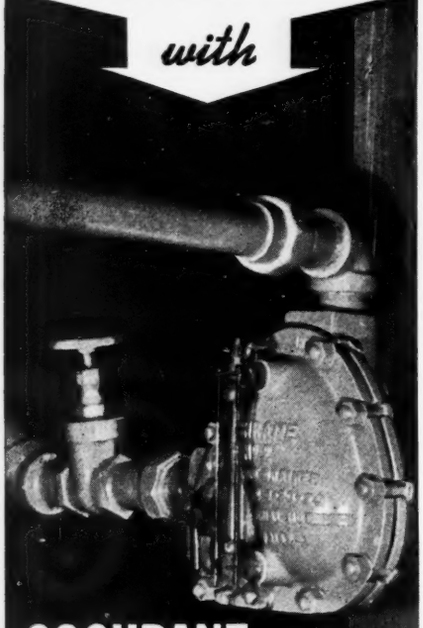
DRAINING
LARGE QUANTITIES OF LOW PRESSURE, DIRTY CONDENSATE
with



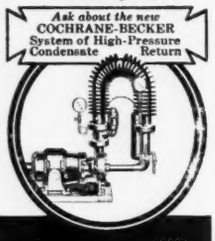
COCHRANE *Multiport* DRAINERS
at **S. D. WARREN CO.'s**
Cumberland Mills, Maine
• PAPER MILL •

MANY Cochrane Multiport Drainers are in use at the Warren Cumberland Mills plant as they are in many other paper mills. The reason for their satisfactory operation is told by Mr. F. L. Wellcome, steam engineer at this plant: "These traps discharge continuously, the valve opening being determined by the height of water in the float chamber; the larger the volume of water, the larger the valve opening. The rotating movement of the sleeve valve serves to keep the valve free of sludge accumulation."

Write for Publication 2925 on Multiport Drainers

COCHRANE CORPORATION
3106 N. 17th St. Philadelphia, Pa.

Rapidly removes hot condensate from steam process equipment and returns it to boiler at high pressure and close-to-process temperature. IMPROVES QUALITY, INCREASES PRODUCTION, CUTS COSTS.



Cochrane

Davis, Inc, New York, was elected by a letter ballot of the 16,250 members of the American Society of Mechanical Engineers to be president of the Society during 1943. Vice-presidents elected at the same time to serve two-year terms on the Council of the ASME were Joseph W Eshelman, president, Eshelman & Potter; Thomas E Purcell, general superintendent of power stations, Duquesne Light Co; Guy T Schoemaker, vice-president, Kansas City Light & Power Co; Walter J Wohlenberg, professor of mechanical engineering, Yale University. Managers of the society elected to serve on Council for three-year terms include Roscoe W Morton, Alexander R Stevenson, Jr, and Albert E White. The new officers will be installed during the 63rd annual meeting of the society to be held in New York, N. Y., at the Hotel Astor.

FREDERICK POST CO, Box 803, Chicago, Ill., announces 1943 calendar for the drafting room, made up in form of 52 weekly sheets, with large numbers. Includes a section of technical data for engineers and draftsmen containing charts on wire and sheet metal sizes, screw threads, etc. Available to engineers and draftsmen upon request on business letterhead.

WESTINGHOUSE ELECTRIC & MFG CO, East Pittsburgh, Pa., announces the following personnel changes: James S Hagen, of La Grange, Ill., has been appointed manager of the Northwestern district of the company's district manufacturing and repair department. He succeeds R E Powers, now serving as Pacific Coast district manager of the department. A E Hitchner, former manager of the Los Angeles office, has been appointed assistant to the manager of the company's industry sales departments with headquarters at the East Pittsburgh works. Ray W Murphy, formerly Pacific Coast district manager of the Westinghouse Lamp Division, has been made manager of sales promotion of the division's executive offices. Herbert J Burgess has been made general superintendent in charge of all manufacturing at the company's East Springfield plant. Clarence E Shiplet, superintendent of erection and machining at the Louisville Division, has been awarded the Westinghouse Order of Merit for distinguished service. Daniel G Bolling was named superintendent of the switchgear division, succeeding E R Nary, who was appointed manager of manufacturing for the radio division in Baltimore. Carl A Pickering was named

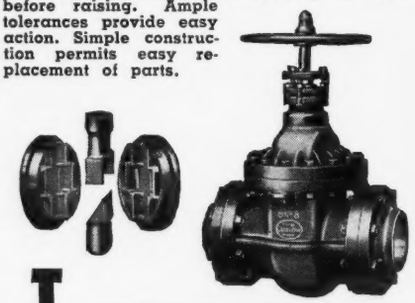
SABOTEUR FOILED!

There's an invisible saboteur at work, in your plant, every day of the year! . . . the destructive force of rust, scale and corrosion that cripples your valves and other metal equipment.

Ludlow Valves are made of the best materials—built to stand up under long years of use. That's why Ludlow Valves installed years ago are able to meet the tough requirements imposed by today's abnormal service—*without time out for repairs!* Employing the famous double-disc, parallel seat principle, developed and perfected by Ludlow, these rugged valves work smoothly, close securely—even after years in the open position. In peace or war, *Ludlow means value in valves.* Send for Catalog.

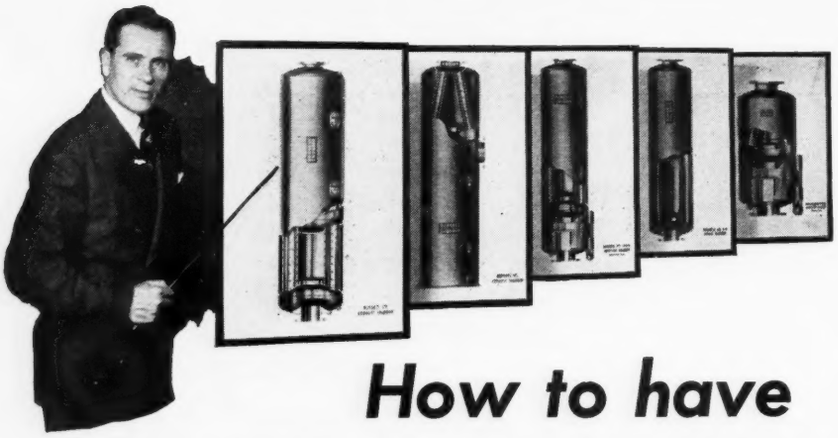
THE LUDLOW VALVE MFG. CO., INC.
Troy, New York

Construction Features: Self-releasing 30° angle wedges and free floating gates, self-adjusting to seats, afford smooth, trouble-free performance, long service. Rings are cleaned throughout stroke action. Gates are wedge-locked directly opposite ports and completely unwedged before raising. Ample tolerances provide easy action. Simple construction permits easy replacement of parts.



LUDLOW VALVES
SINCE 1866

Bartlett·Snow
CENTRAL STATION EQUIPMENT
—including rail, boat and truck receiving facilities, large capacity belt conveyors, feeders, bunkers, crushers, distributors, coal storage and reclaiming systems, meets every central station requirement. Eng. Bul. No. 83, describing recent installations and giving construction details of typical equipment units, sent on request. The C. O. Bartlett & Snow Co., 6205 Harvard Ave., Cleveland, Ohio.



How to have QUIET EXHAUSTS on Diesel Engines

Sectional view of Burgess STC Exhaust Snubber.

There was a time when Diesel engines meant loud and objectionable exhaust noise. This is no longer true. Now Diesel exhausts operate quietly in municipal power plants, industrial plants, hotels, office buildings, and hospitals, as well as on ships and in portable power plants of all types. Burgess Exhaust Snubbers make this possible.

Burgess Snubbers operate on the patented snubbing principle of quieting Diesel exhausts by removing the source of noise before the noise can occur. Removal of objectionable noise and pulsation is effected without impairing efficient operation of the engine. Burgess Battery Company, Acoustic Div., 2823-L. W. Roscoe St., Chicago.

HOTEL—*In Grand Forks, N. D., the Hotel Dacotah operates two Snubber-equipped engines.*

MUNICIPAL PLANT—*Jasper, Texas, power plant, "deep in the heart" of east Texas.*

BURGESS DIESEL EXHAUST SNUBBERS

BETTER SERVICE — SAFETY — SATISFACTION
FOR REPLACEMENTS ORDER

PRECISION GAGE GLASSES and GAGE GLASS GASKETS THAT WILL NOT BLOW OUT

Standard Square Cut Gaskets High Pressure Non-hardening and Non-softening

GASKETS THAT WILL FIT EXACTLY

Red Lip-mold Pattern Expansion Type Gasket

Send for Glass and Gasket Chart

Shipment made by parcel post the same day as order is received

ERNST WATER COLUMN & GAGE CO.
RUBBER & GLASS DIVISION LIVINGSTON, NEW JERSEY

assistant superintendent of the division and placed in charge of switchboard devices and small de-ion circuit breakers. Roger W Warren was appointed assistant superintendent in charge of Navy switchboards, metal-clad gear and large oil circuit breakers. Thomas O Armstrong has been named manager of the industrial relations department at the East Springfield plant. Ralph R Brady has been named manager of the commercial engineering department at the company's lamp division in Bloomfield, N. J. Mr Brady succeeds D W Atwater, recently appointed manager of the new illuminating engineering department.

FOOTE BROS GEAR & MACHINE CORP announces the recent addition to its contact engineering staff of Irwin A Marshall to represent the company in the Cleveland and northern Ohio territory. Mr Marshall has been serving industry for the past twelve years in Ohio and the Central States as a sales engineer. He is widely known in this area as an expert in the power transmission field.

INDUSTRIAL PRODUCTS SALES DIV, B F GOODRICH CO, announces: L H Chenoweth, manager of manufacturers' sales, has resumed his duties after serving with the War Production Board in Washington. W E Williams has been appointed chief clerk of the Akron district office, and Bert Schell to the belting sales department. R E Lewis, sales correspondent in the Akron offices, has entered the United States Navy as a chief petty officer. O B Roberts, manager, Chicago district, has just completed thirty years of service with the company and has been presented a 30-year pin.

THE HEWITT RUBBER CORP has now completed the manufacture of an all-synthetic rubber conveyor belt which is believed to be the first of its kind made from Buna S synthetic rubber, without the addition of natural rubber or reclaimed rubber. This is the result of early pioneering in the production of synthetic rubber products by the basic industries of the nation, since the introduction of the oil-resistant type of synthetic rubber in the United States. in 1931.

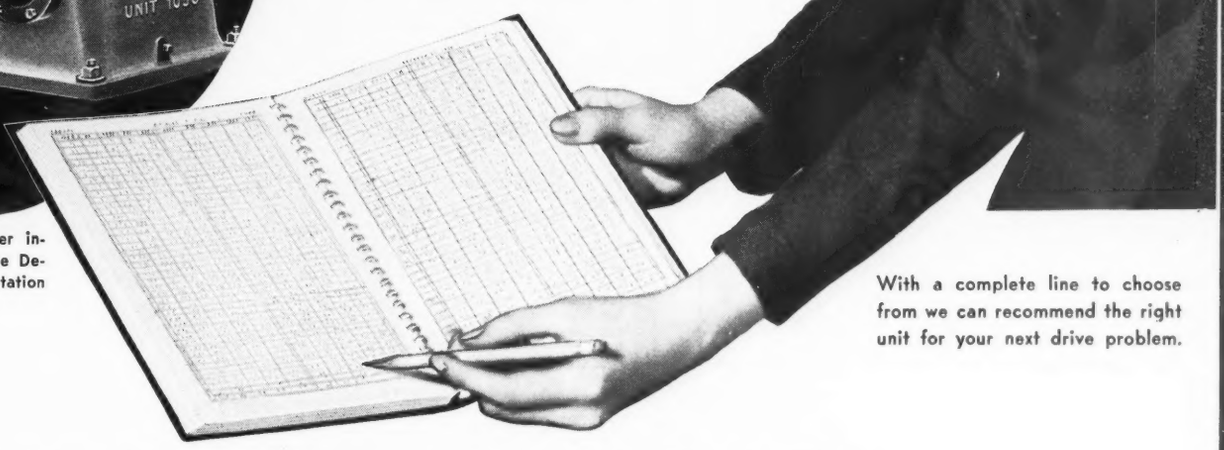
BAILEY METER CO announces the appointment of L F Richardson as branch manager of its newly established Los Angeles office and Mr H T Sawyer as branch manager of its newly established Seattle office. Both Mr Richardson and Sawyer had previously been

YOU CAN SEE BY THE RECORDS PHILADELPHIA SPEED REDUCERS ARE PHYSICALLY FIT FOR WARTIME SERVICE

A Philadelphia Worm Gear Reducer installed in the Electrical Maintenance Department of an Eastern Transportation Company.

Yes, Philadelphia Speed Reducers of all types, when properly selected for the intended service will solve your problem of transmitting power with a high degree of efficiency to machines running long, steady hours, turning out the weapons of war.

Philadelphia Units are ruggedly constructed and amply housed with sufficient area for heat dispersion. Each one embodies certain custom built qualities and individual service characteristics that assure its performing efficiently and with little attention.

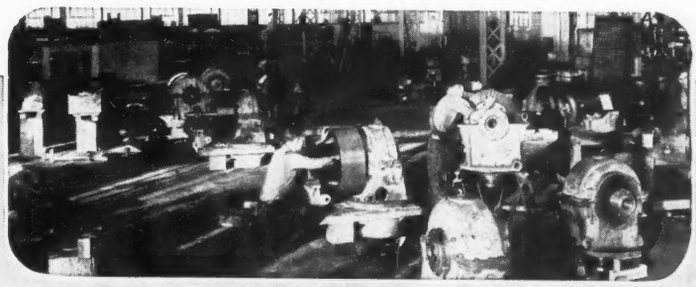


With a complete line to choose from we can recommend the right unit for your next drive problem.

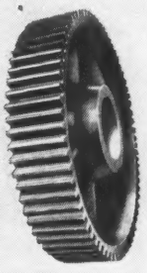
PHILADELPHIA GEAR WORKS

INDUSTRIAL GEARS AND SPEED REDUCERS MITORQUE VALVE CONTROLS

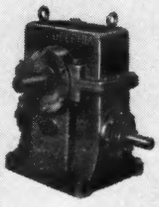
ERIE AVENUE & G STREET
PHILADELPHIA, PA.
New York, Pittsburgh, Chicago



Philadelphia **LIMITORQUE CONTROL** operates all types of valves, etc., safely, economically, from convenient stations.

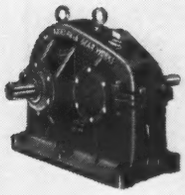


Philadelphia **GEARS** All types and sizes of industrial gears. Can be supplied in all materials.



Philadelphia **WORM GEAR SPEED REDUCER** right angle drives — vertical or horizontal. Wide range of ratios and horsepowers.

Philadelphia **MOTOREDUCER** The economical self-contained drive, Horizontal or Vertical types — various ratios and horsepowers.



Philadelphia **HERRINGBONE SPEED REDUCER** for heavy loads at high speed. Single, Double, Triple Reductions, various ratios and horsepowers.

FIRST AID for WARTIME BEARINGS

Careful use of bearing metals helps the war effort two ways . . . much needed metal is saved . . . and machines stay on the job longer.

- **LINE OLD BRONZE BUSHINGS WITH BABBITT**
- **USE MAGNOLIA'S SUBSTITUTES FOR TIN-BASE BABBITTS**
- **USE THE PROPER METAL FOR EACH BEARING**

Free Bulletin Shows How To Make Better Bearings

Shows what metal to use where. Write for this valuable data book.

MAGNOLIA METAL CO.
18 West Jersey Street, Elizabeth, N. J.

MAGNOLIA BEARING METALS

Power Plants lengthen life of furnace linings WITH

ADAMANT FIRE BRICK CEMENT

To quote from a customer's letter: "We have used ADAMANT for several years in our main plants here under our boilers . . . to say the least it is the only real brick binder we have found that will withstand the intense heat and sudden changes prevalent in our line." Impartial laboratory tests prove that ADAMANT has a bonding strength of 800-lbs. at room temperature—1270 lbs. per sq. in. at 2600° F. Let us send you complete data.

BOTFIELD REFRACTORIES COMPANY

784 S. Swanson St., Philadelphia, Pa.

In Canada, Canadian Botfield Refractories Co., Ltd., 171 Eastern Avenue, Toronto.

HERE'S HANDY HELP

for solving technical and business problems

When you want information fast—for dealing with difficult production problems, for settling special managerial questions, or for handling the "1001" situations that arise in every shop, office, laboratory and field—

get the facts—experience—data you need to solve your particular problems from

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located in Los Angeles and Seattle, but had functioned as representatives of the San Francisco branch office. Mr V A Rumble, manager of the company's San Francisco branch office, continues as West Coast supervisor.

DETROIT REX PRODUCTS CO announces the appointment of A O Thalacker as general manager. Mr Thalacker has been a company executive for the past five years and lately has been secretary, a position he retains in addition to his new responsibility.

CONSTRUCTION MACHINERY DIV, CHAIN BELT CO announces that A W Thomas, sales manager, has left for Washington where he will be a consultant for the Construction Machinery Division of the War Production Board. During his absence his duties will be taken over by D A Kalton, assistant sales manager of the Construction Machinery Division.

Group To Assist Coal Stockpilers

To assist commercial coal users in minimizing storage losses, the Division of Solid Fuels Utilization for War of the Bureau of Mines is organizing a group of experts to advise industries on best methods of stockpiling coal to avoid spontaneous heating and degradation of the stored product, Dr R R Sayers, Director of the Bureau, announced.

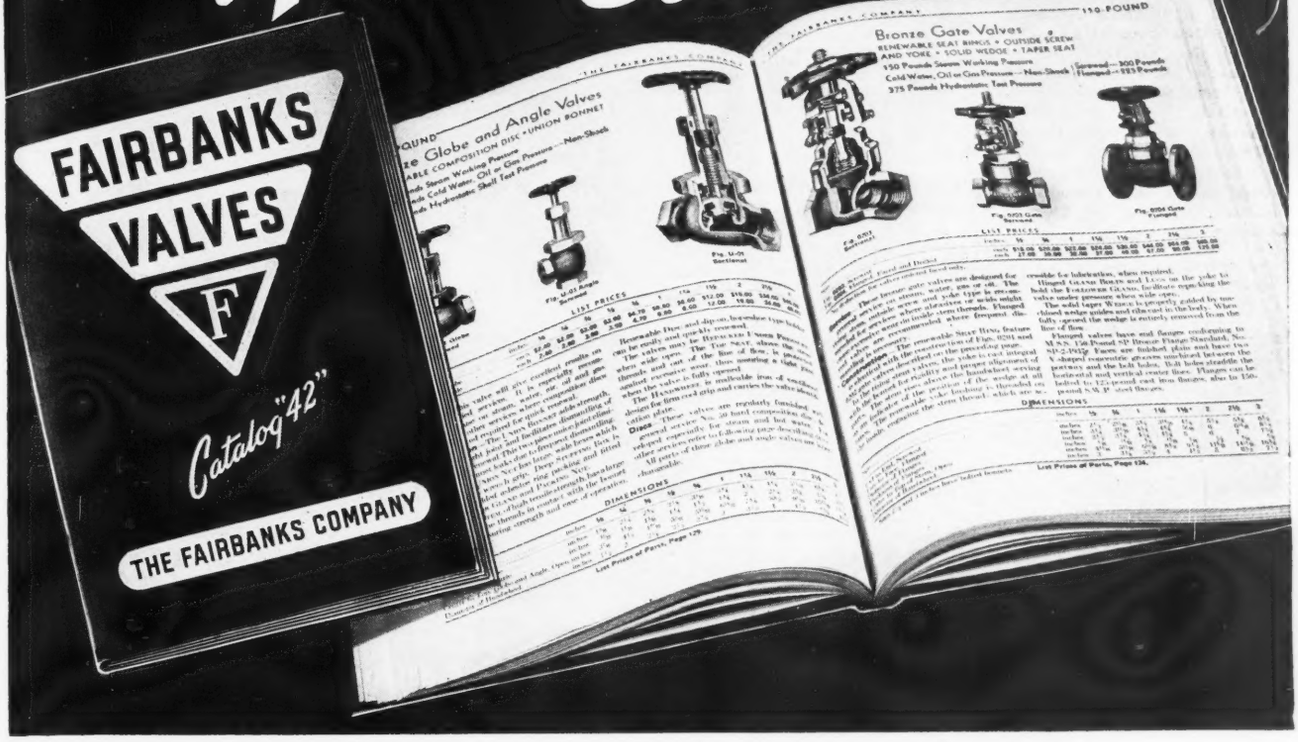
Industrial users of coal have established or are planning to accumulate larger reserves to avoid possible transportation difficulties, Dr Sayers informed Secretary of the Interior Harold L Ickes, and it is extremely important that damage to stockpiles be controlled so that war production will not be impaired. Coal-storage problems have increased because larger amounts are being stored and many new consumers now are stockpiling coal for the first time, the Director added.

The Bureau of Mines is making a survey of the action of coal in storage under various conditions in all parts of the United States. Experts who will assist in this survey include W D Langtry, H C Carroll, W W Anderson, G E Keller and R W Langtry, all of the Commercial Testing and Engineering Company, 307 North Michigan Ave, Chicago, in the Midwest; and Douglas Henderson and C T Engvaldsen of Gould, Henderson and Brunhes, 215 Fourth Ave, New York, in the East.

To hasten the date when the Bureau's new service will be fully effective, Dr

FAIRBANKS PRESENTS

a New Catalog



Our Catalog No. 42, illustrating and describing Bronze and Iron Valves and Dart Unions, is just off the press and ready for distribution.

In preparing this catalog, we have endeavored to supply valve users with a clear, concise and easy-to-read reference book. The descriptions and illustrations are complete. Enlarged sectional views show all construction details. Valves for special services are grouped in separate sections. Also included are list prices and illustrations of valve parts, as well as many tables of useful information relating to valves and piping.

The service and construction details, grouping, indexing, etc., have been arranged so as to be of the utmost convenience to users.

To get your copy of this new FAIRBANKS CATALOG No. 42 without cost or obligation, write or simply mail the coupon.

THE FAIRBANKS COMPANY
397 LAFAYETTE ST., NEW YORK, N. Y.
Boston, Mass., Pittsburgh, Pa.

Fairbanks F
Standard and Renewable **Valves**

The Fairbanks Company
397 Lafayette St., New York, N. Y.
Without obligation you may send a copy of your catalog No. 42.

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CONTROL EQUIPMENT by

★K&M CONTROL ENGINEERS since 1879

REDUCING VALVES

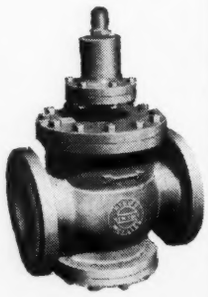
Kieley & Mueller Reducing Valves — the products of more than 63 years specialized experience in the design and manufacture of steam specialties — include types for all services as follows: (a) ordinary reduction with comparatively constant inlet pressure and continuous flow; (b) ordinary reduction with comparatively constant inlet pressure but for dead end service; (c) pulsating inlet pressure or highly varying loads maintaining constant reduced pressure; (d) high pressure drop.

Shown here are two widely used types.

SPRING LOADED REDUCING VALVE

Suitable for steam or gas; for initial pressure to 400 lb.; made in cast steel for high pressures. Sizes: ½" to 12". Recommended for use as primary valve in double reduction installations for heating systems or for steam or gas reduction service in industrial process.

We're "ALL OUT" so the AXIS will be "ALL IN" Please bear with us for the duration —



INTERNAL PILOT REGULATING AND REDUCING VALVE

Designed for steam, oil and water; built for initial pressures of 300 lb. or less and for reduced pressure ranges of from one lb. to 75% of the initial pressure; excellent for pulsating inlet pressures and other difficult conditions. Dead end single seat shut off. Sizes: ½" to 10".

KIELEY & MUELLER

General Offices and Factory

2013-2033 — 43rd Street, North Bergen, N. J.

Reducing Valves — Liquid Level Controls — Float Valves — Pump Governors — Strainers — Control Specialties.

A GOOD Pillow Block

FIG. 1635

"STANDCO" PILLOW BLOCKS

The "STANDCO" Pillow Block is accurately and sturdily built. The babbitted bearing surfaces are highly finished, and both faces are *machined*. Complete range of sizes.

"HALLOWELL" STEEL SHAFT COLLARS

Precision machined, nicely finished, separately wrapped and fitted with the famous "UNBRAKO" Self-Locking Set Screw—in all desired sizes.

FIG. 1432 PATENTED

Write for Details

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA. BOX 577

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SAVE FUEL OIL FOR VICTORY

BY TREATING IT WITH KIL-SLUDG

Eliminate sludge conditions in tanks, pipe lines and preheaters with KIL-SLUDG and assure complete combustion of fuel oil.

KIL-SLUDG—specially compounded for effective treating of Fuel Oil. One customer reports: We find that it keeps the burner tips and heaters very clean and free from Sludge; in fact, where formerly we were using three heaters, we found we could cut down to two and still maintain our temperature

TRY IT TODAY!

Send trial order at once advising the nature of the sludge problem you want to solve. Ask for further details.

STANDARD CHEMICAL CO.

NATICK, MASS.

Sayers requested that persons encountering difficulties in the storage of coal in commercial quantities immediately inform the Division of Solid Fuels Utilization for War, Bureau of Mines, Washington, D. C., or the nearest of the two consulting firms. Simultaneously, the Bureau is sending questionnaires to commercial users of coal throughout the Nation to obtain the "case histories" of various coals in storage. Data obtained from these questionnaires will be assembled in Washington, D. C., so that the information may be summarized and made available to those seeking solutions to storage problems. The Director explained that the Bureau in former years has published considerable data regarding coal storage methods in its long-time program to aid commercial consumers of coal.

Order No. L-193

The over-all importance of conveying machinery and mechanical power transmission to the war effort was emphasized with the issuance of Limitation Order No. L-193.

The order does the following things:

1. Sets up machinery for scheduling production and makes mandatory the filing of monthly schedules with the War Production Board.

2. Conserves engineering man hours by prohibiting engineering services, except with respect to authorized orders where the individual order amounts to more than $5,000. Orders under this amount are subject only to materials restrictions.

3. Conserves critical material by imposing restrictions upon all orders, with certain exceptions.

In issuing the Limitation Order, WPB officials pointed out that the conveying system is the backbone of mass production. Any curtailment in the manufacture of new conveying machinery and mechanical power transmission equipment for war production plants, or any curtailment in the production of parts for such equipment now in operation,

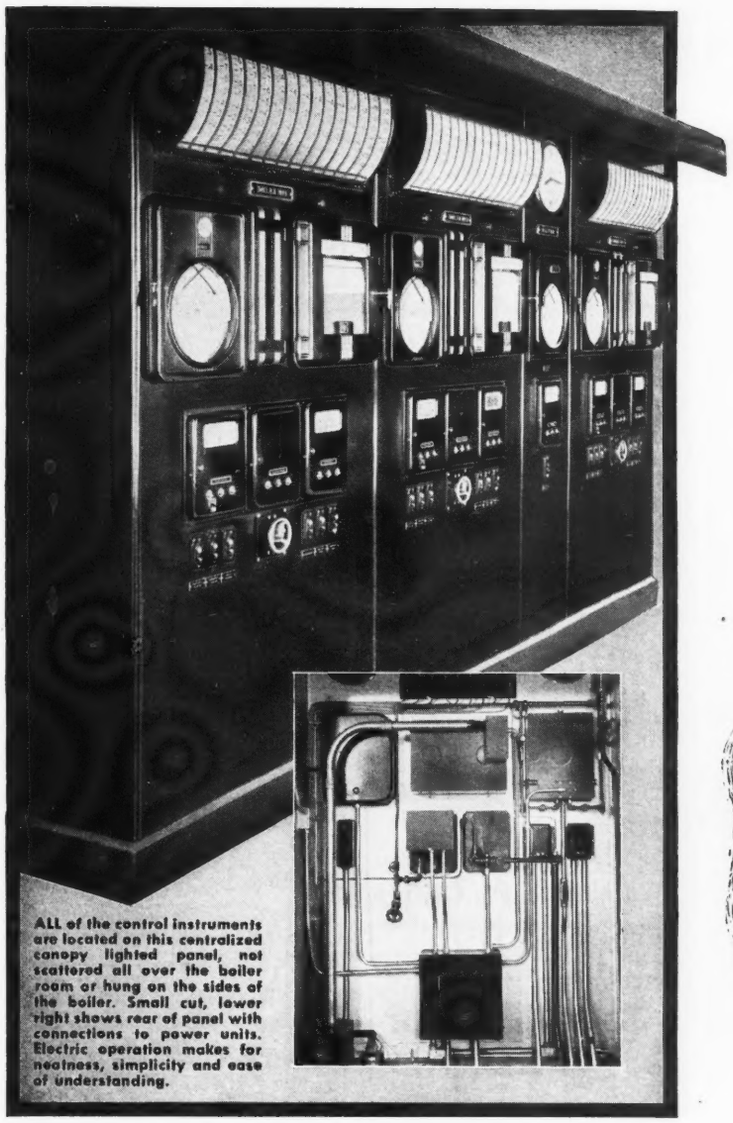
MEETINGS

American Society of Refrigerating Engineers—*Annual Meeting, November 30-Dec. 2 Hotel Commodore, New York, N. Y.*

15th National Exposition of Power and Mechanical Engineering — *Madison Square Garden, New York, N. Y., November 30 to December 5, 1942*

American Society of Mechanical Engineers —*63rd Annual Meeting, November 30-December 4, 1942, Hotel Astor, New York, N. Y.*

Engineers Society of Western Pennsylvania —*Third Annual Water Conference, November 9-10, 1942, Wm Penn Hotel, Pittsburgh, Pa.*



ALL of the control instruments are located on this centralized canopy lighted panel, not scattered all over the boiler room or hung on the sides of the boiler. Small cut, lower right shows rear of panel with connections to power units. Electric operation makes for neatness, simplicity and ease of understanding.

Electric
ALL THE WAY!

HAYS
CENTRALIZED AUTOMATIC COMBUSTION CONTROL

Stokers, pulverizers, fans and oil burners are more and more becoming electrically driven. It is entirely logical therefore that an automatic combustion control system be operated electrically. Hays *centralized* control is operated entirely by electricity, employing enclosed mercury switches for the sensitive contacts, thus assuring freedom from trouble due to moisture, dust, dirt and chattering. Electric operation also simplifies installation and maintenance. Adjustments are made direct and are not dependent upon air pressures, oil pressures, and the numerous valve mechanisms made necessary by non-electric designs. When considering automatic combustion control buy for tomorrow—buy electric—buy HAYS.

HAYS

Automatic
COMBUSTION CONTROL
THE MODERN SYSTEM—*it's Electric!*

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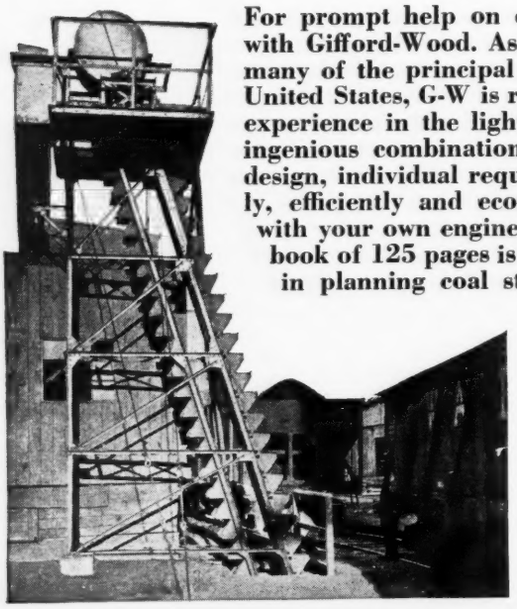
For Prompt Help on Coal Storage



For prompt help on coal storage, get in touch with Gifford-Wood. As designers and builders of many of the principal coal storage plants in the United States, G-W is ready to apply unsurpassed experience in the light of today's needs. By the ingenious combination of standard and special design, individual requirements are met promptly, efficiently and economically in co-operation with your own engineers. Bulletin 200, a bound book of 125 pages is full of proved ideas useful in planning coal storage, coal and ash handling, elevating and conveying systems. A request on your business stationery will bring you a copy.

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The next thing to

Test-Gauge ACCURACY!

You get it in Lonergan gauges! They're designed and built to provide practically the same precision found in high quality test gauges — yet, have plenty of stamina for hard, constant service.

Choose from this complete line of vacuum, ammonia or hydraulic combination gauges when you need accurate measure of steam, air, water, or other pressures.

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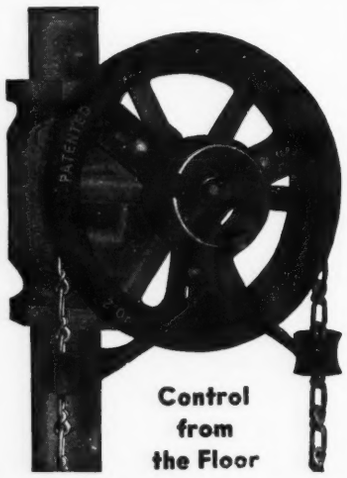
VALVES · GAUGES
SPECIALTIES

Make Your Overhead Valves SAFE And Easy to Reach---



Control from the Floor

With the Babbitt Rim for Valves you eliminate danger and banish the step-ladder. You can now place your valves wherever they come economically and conveniently. They fit any valve. Let us tell you more about them. Write today.

BABBITT STEAM SPECIALTY CO.
New Bedford, Mass.

would be promptly reflected in lower quantities of guns, tanks, planes and other war making machinery.

It is estimated that the conservation provisions in the order will save approximately 25,000 tons of steel in the fourth quarter of 1942.

15th National Power Show Fulfills War-Time Needs

Continuously increased interest in recent weeks proves the 15th National Exposition of Power and Mechanical Engineering to be fulfilling many new-found needs. Transfers of the Exposition to its new location in Madison Square Garden has been successfully accomplished.

The Exposition is to be held November 30 to December 4 in the Exposition Hall of the Garden, which has the advantage that it permits all exhibits to be staged on one floor. A special entrance has been provided through a new lobby on 49th Street, just West of Eighth Avenue, giving separate and direct access to the Show at all times.

The business office of the Show, including the booking of space and completing arrangements for handling the displays, however, remain at Grand Central Palace, where only the former exposition floors have been taken over by the Army for an induction center. This is the permanent headquarters of the International Exposition Company, under whose management the Exposition is conducted.

Contributing To War Effort

Recognized for twenty years as a national market for the newest products of research and invention in power and mechanical engineering, the Exposition this year has been organized for the special purpose of contributing to the Nation's war effort by concentrating at one time and place equipment, information and the mental resources needed to maintain and increase power production and to use it more efficiently.

Heretofore the Exposition, which is a biennial event, has been a means of introducing new products and improvements in power plant equipment. Now its uses are considerably broadened by wartime conditions.

One direction in which the interest is great is the substitution of more common materials for those which are scarce or allocated to government needs. Many products have been redesigned within the year to avoid obstructions caused by scarce materials.

A situation common to a large proportion of executives and operating en-

TO FACILITATE quickly the installation of new and the conversion of old drives, Morse Dealer and Factory Branches in many parts of the country are maintaining readily available stocks of Morse Silent Chain Drives, Roller Chain Drives and Sprockets. Every effort is being made to keep these stocks adequate to meet your drive requirements. This service is maintained to keep War production rolling. Call on your local Morse Representative. If he cannot meet your specifications out of stock, he will assist you in securing such from the factory.

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MORSE *positive* DRIVES

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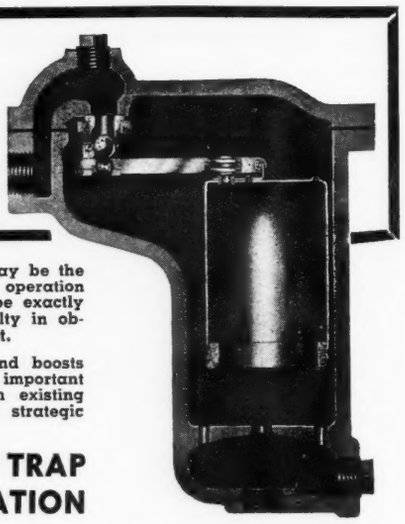
THE
CRYER STEAM TRAP
will save fuel by eliminating steam waste



This tried and proved inverted bucket trap may be the answer to your problem of attaining full-load operation without excessive fuel consumption; it may be exactly what you need without the delay and difficulty in obtaining additional steam generating equipment.

The fact that the "CRYER" saves steam and boosts effective boiler capacity makes it a vitally important means of helping you get more power from existing equipment today with a minimum use of strategic materials.

WHY THE CRYER IS THE TRAP FOR "ALL OUT" OPERATION

. . . accessibility speeds maintenance
. . . positive action assures quick venting and prevents dribbling
. . . all air discharged ahead of condensate eliminates binding
. . . high capacity assured by baffle plates which prevent surges from lifting bucket and closing valve; large orifice made possible by powerful leverage
. . . stainless steel wearing parts and free turning ball valve insure low maintenance
. . . installation easily made without special supports
. . . satisfactory operation guaranteed

Made in sizes from ½" to 2½" for capacities from 500 to 38,000 lb. of water at pressures from 0 to 250 lbs.

Send at once for complete details **We carry all sizes of traps and repair parts of the line formerly known as the J-M Ball Steam Trap.**

CRYER TRAP AND VALVE CO. INC.
Manufacturers of steam specialties for more than 40 years.
366 MADISON AVE. NEW YORK, N. Y.

TOUGH OVERLAY for WORN-OUT WOOD FLOORS

Add years of useful service and improve the efficiency of rough, splintered wood floors with an overlay of durable RUGGEDWEAR RESURFACER. Though light in weight, your new floor will have a smooth, tough, fire-resistant surface. Its resilience will withstand the stress and strain of any vibration. RUGGEDWEAR may also be used for repairing holes, cracks and ruts in concrete floors to a solid feather edge. Easily applied . . . you mix the material and trowel it on. Dries fast. **Request Valuable Descriptive Folder on Tough Floors.**

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WHEN you consider the cost of low pressure air at about 1 H.P. per 100 C.F.M., you will quickly realize the economy of Rockwell Blast Gates—the kind that are air-tight, non-chattering and provide better control of your air lines.

Light, strong, carefully machined to close air-tight, Rockwell Blast Gates are available in all types. They can be made up in aluminum, monel, bronze or other alloy metals to meet your requirements.

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BLAST GATES

gineers who will be among the visitors to this year's Power Show is that where increased power demands must be met by improving the efficiency of the plant, rather than by expansion.

Still another direction in which many new problems have arisen has been brought on by conversion of many plants to new types of war work, including changes in plant arrangement and the installation of a great deal of new machinery. This has created problems in the redistribution of power.

Informational Purpose Served

There is every indication that the attendance will be substantial and the rewards of information and ideas large, justifying the cooperative spirit of the exhibitors in making the Exposition to serve more than ever as an educational and informational institution at this critical time.

The scope of the undertaking is revealed by the management's analysis of the last Power Show, which was held in 1940, at which there was a total attendance of 34,087 by invitation and registration only, there being no admission of the general public.

Visitors came to that show from 1047 cities and towns in 39 of these United States and from 15 foreign countries. They represented nearly 60 industries and professional avocations. The occupational analysis further revealed that more than 10,500 of the visitors were business men of executive rank, while 10,600 others were directly associated with power plants or power using industries as plant managers, superintendents, chief engineers, master mechanics and designers. Nearly 8,000 engineers were in attendance, including those in civil, mechanical, mining and metallurgical fields, as well as chemists, research directors and physicists among others. More than 2,000 visitors in another professional group at the last Power Show were associated directly with plant planning and construction.

Survey Conducted

Approaching this year's exposition, the Management conducted a survey among visitors who were registered at the Power Show of 1940. This revealed that more than 60 per cent of those planning to visit this year's show were interested principally in power plant equipment, including apparatus for generation, control and distribution of power. On the other hand, an increasing amount of interest was shown in power utilization, such as transmission equipment, material handling, electrical equipment—such as motor drives and controls — tools and machine tools.

Save installation time with B&W Tubes

SPEEDY, easy installation is insured by the dimensional accuracy of Babcock & Wilcox Seamless Steel Boiler Tubes. Where complicated bends are required, additional installation time is saved by precision-bending at the B&W mill, where single tubes have been accurately formed with nineteen bends in fourteen planes and where five bends in five planes are common.

All B&W Tubes are made of the finest "guaranteed quality" steels—by unique B&W-developed methods—in a specialty tube mill where quality and accuracy have always taken the precedence over tonnage. Each tube is individually inspected.

This extra quality in B&W Seamless Steel Boiler Tubes pays dividends in long tube life as well as ease of installation.

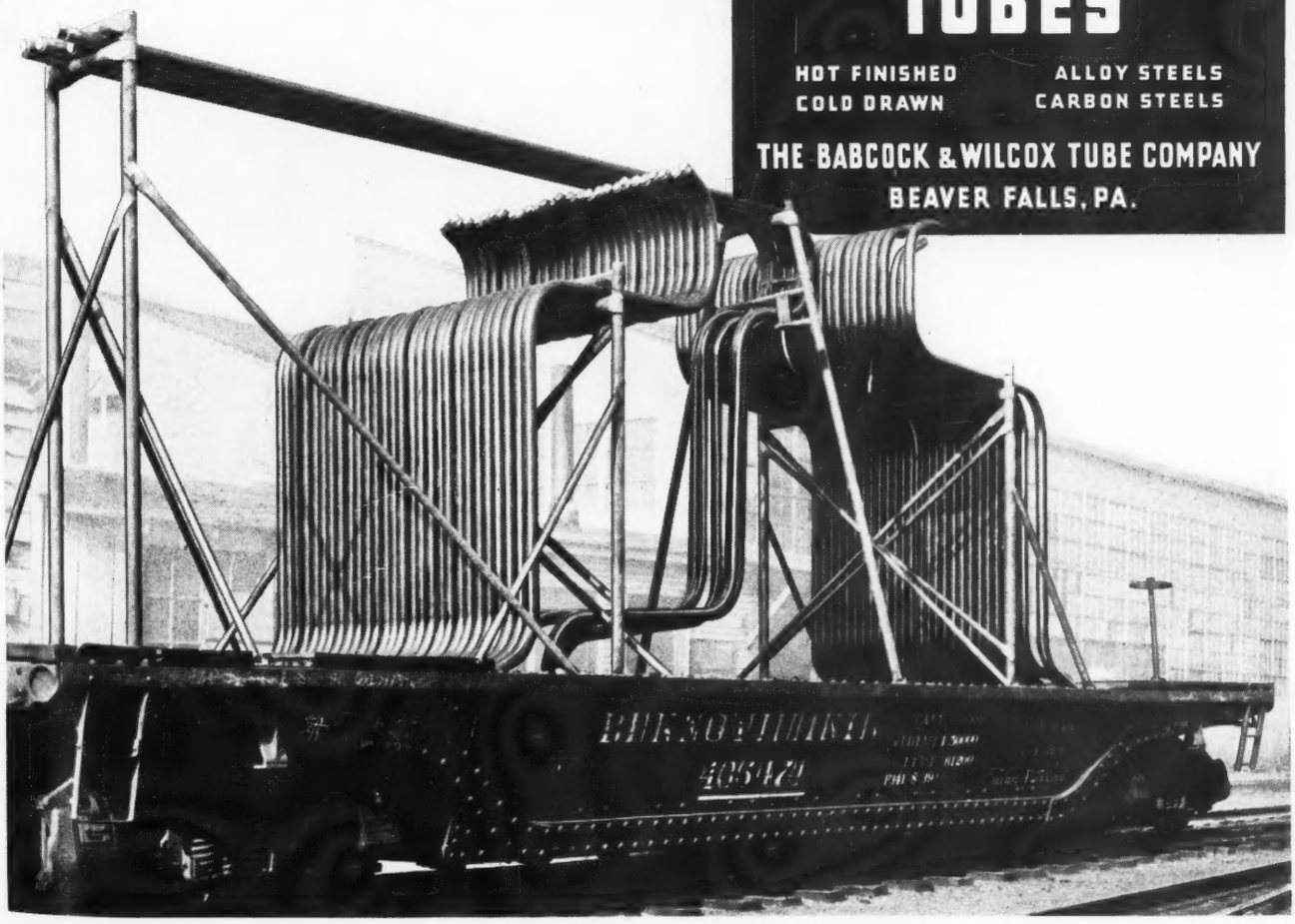
TA-1216

BABCOCK & WILCOX TUBES

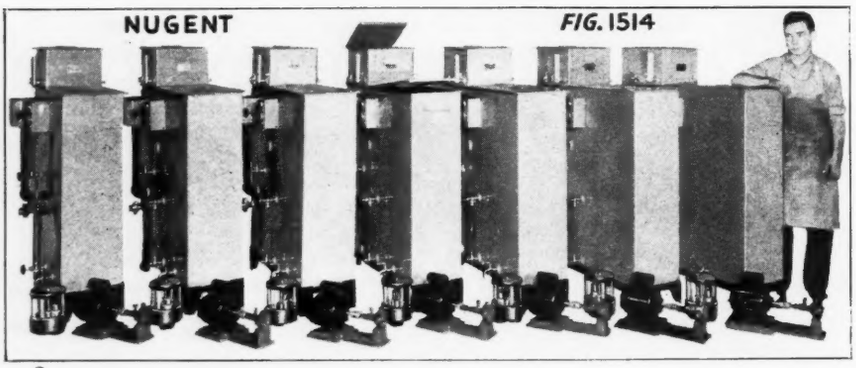
HOT FINISHED
COLD DRAWN

ALLOY STEELS
CARBON STEELS

THE BABCOCK & WILCOX TUBE COMPANY
BEAVER FALLS, PA.



NUGENT Filtering Systems
. . . *for use with* Steam Turbines



THE row of 7 NUGENT Gravity Filters illustrated above, complete with Sight Overflows and Motor Driven Pumps, are idicative of how this type of gravity filter may be used efficiently to filter lubricating oil for Steam Turbines in Defense Plants.

Here are some of the outstanding advantages offered through the use of NUGENT Oil Filtering Systems:

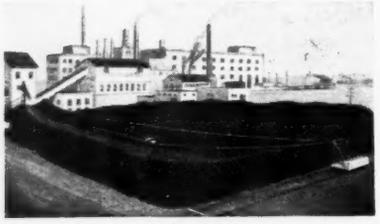
1. Average saving in oil, more than 95%.
2. May be operated continuously. Never necessary to shut down for cleaning —units cleaned independently.
3. No large dirty oil compartment — maintenance extremely simple.
4. Efficient water separation.
5. Acid neutralization.

It will pay you to get the complete data on NUGENT Filters and lubrication Specialties.

WM. W. NUGENT & CO., INC., Est. 1897
402 N. Hermitage Ave. Chicago, Ill.

ECONOMICAL COAL STORAGE - -

Pictured above is a common form of Sauerman scraper coal storage layout for areas of small or medium size. Steel back-posts are spaced at intervals around the outer boundary of the area and the scraper bucket is shifted to different sectors by moving the tail-block on a bridle cable stretched between the back-posts.



This picture shows Sauerman scraper unit with tail-blocks mounted on a mobile tail tower. This type of installation is designed for handling a large tonnage of coal on a good-sized ground space. Generally, the tower is equipped with a motor and propelling mechanism and movement of the tower is governed by remote control from the scraper operator's station.

with insurance against spontaneous combustion

During the thirty years that Sauerman Power Scrapers have been used for storing and reclaiming coal no case has been reported of spontaneous combustion in any Sauerman-made coal pile.

A cross-section of a storage pile properly built by a Sauerman scraper shows the coal in tightly packed layers with voids or air pockets entirely absent. There is no opportunity for air to circulate within the pile to generate heat.

In addition to this safety feature, a Sauerman installation offers a number of other advantages. First cost of the equipment is reasonable, maintenance amounts to very little, and the simplicity of the operation permits placing the complete control of even the largest installation in the hands of one operator.

Write for catalog.

SAUERMAN BROS., Inc.
562 S. Clinton Street Chicago, Ill.

metals, plastics and substitutes and metal working in the way of welding, soldering and brazing.

Massachusetts University Extension Courses

The Massachusetts Department of Education announces several university extension courses in electrical power engineering.

Henry Kurth, electrical engineer, will conduct an evening course on industrial electricity. This course is also offered by correspondence and includes electrical calculations, wires, arrangement and calculation of layouts, control of circuits, transformers, generators and motors, overhead line work, underground line work, and estimating jobs. The same instructor will conduct a course on electrical power-plant operations. This was designed particularly for operators and repairmen of generating stations and substations in public-utility systems and industrial plants.

Another course on industrial electronics will be in charge of Edwin B Dallin, engineering department, Submarine Signal Co, and formerly radio engineer with the U. S. Naval Research Laboratory. This course is intended to explain the construction and application of various kinds of control devices operated by means of electron tubes. A course on direct-current machinery is scheduled to be offered in 1943-44, and planning for this course is under way at the present moment.

Steel Specifications For Stationary Boilers

Three American Standards governing specifications for steel for stationary boilers, boiler rivets and pressure containing parts have been approved by the American Standards Association. The first standardizes specifications covering carbon-steel plates up to 4 in., inclusive, in thickness for stationary boilers and other pressure vessels; the second set of specifications cover rivet steel and rivets for use in such boilers, and the third covers carbon-steel castings for valves, flanges, fittings and other pressure containing parts for high-temperature service. The specifications, which were developed under the leadership of the American Society for Testing Materials, apply to such aspects as: process, heat treatment, temperature control, chemical composition, ladle and check analysis, tensile and bending properties, tests, workmanship, finish, marking and inspection.

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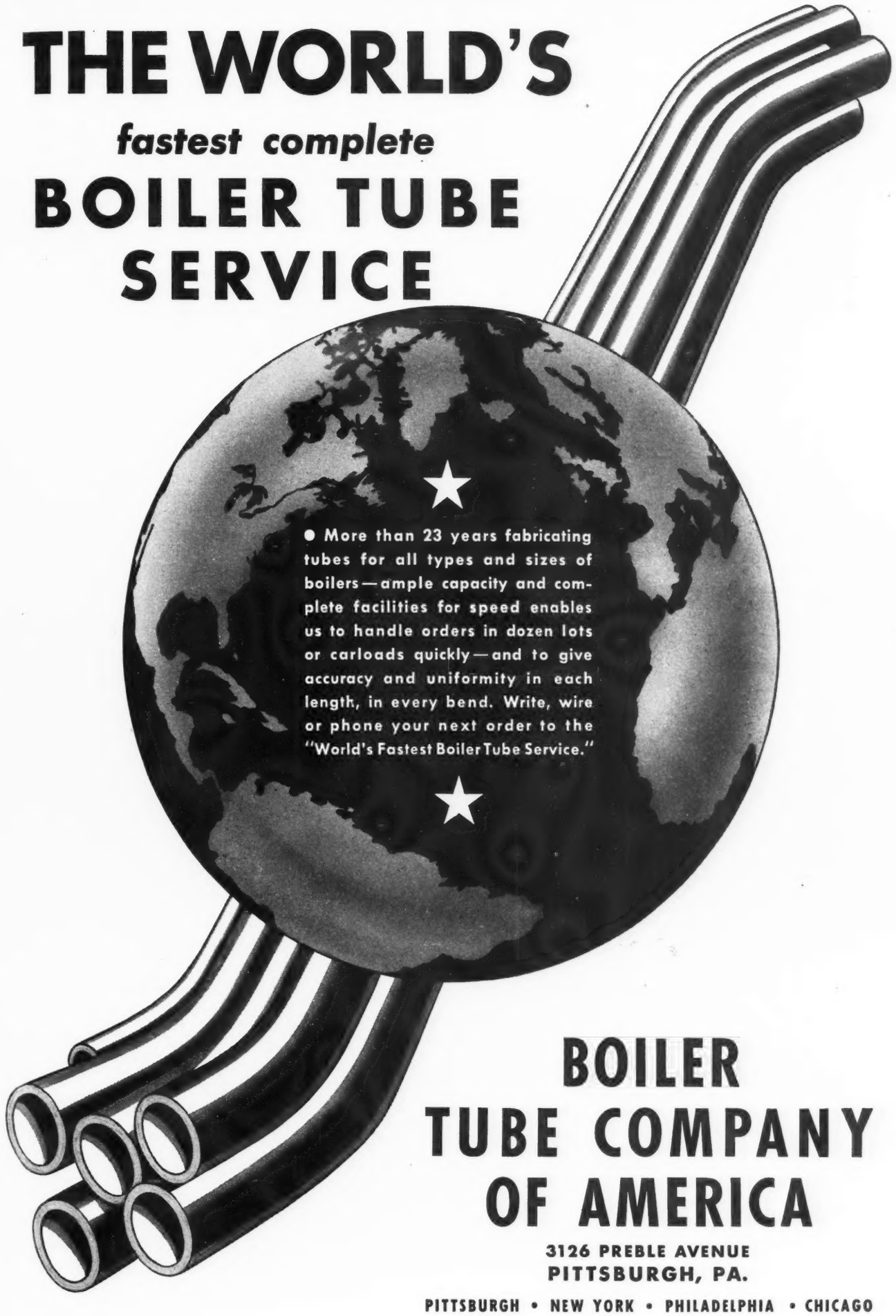
fastest complete
BOILER TUBE SERVICE



● More than 23 years fabricating tubes for all types and sizes of boilers—ample capacity and complete facilities for speed enables us to handle orders in dozen lots or carloads quickly—and to give accuracy and uniformity in each length, in every bend. Write, wire or phone your next order to the "World's Fastest Boiler Tube Service."

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IN THESE DAYS OF ALL-OUT PRODUCTION

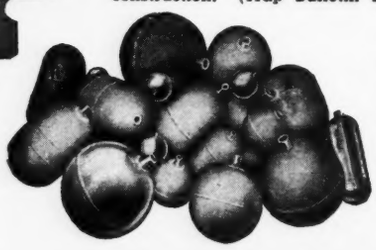
you need **NICHOLSON**

TRAPS ● FLOATS

● CONTROL VALVES

● NICHOLSON TRAPS of the industrial thermostatic type are large in capacity, will not freeze, eliminate air binding, require no adjustment, prevent dribbling, provide intermittent discharge and never water-log. In many cases they step up process production as much as 30%. Pressures from vacuum to 300 lbs. with superheat. Sizes ¼" to 2". Bronze, cast iron, cast steel construction. (Trap Bulletin No. 941)

● NICHOLSON FLOATS are available in all sizes, all shapes for all applications—always dependable! High tensile strength—great external pressure resistance. (Bulletin No. 339)



● NICHOLSON CONTROL VALVES are designed for long life, quick and dependable control of air, steam, oil, gas or water. 2, 3, or 4-way types. (Bulletin No. 140)

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W. H. NICHOLSON & COMPANY
125 OREGON STREET
WILKES-BARRE PENNSYLVANIA, U.S.A.

Rely on Nicholson for: Industrial Steam Traps, Piston and Weight Operated Traps, Control Valves, Floats, Flexible Couplings, Expanding Mandrels, Compression Shaft Couplings, Steam Eliminators and Separators, Compressed Air Traps.

FOR POWER AND PROCESS STEAM

HI-TEST KEWANEE

A quick steaming, ***all-welded*** portable boiler, economical to handle. Refractory lined firebox and two-pass tubes are easy on the fuel bill. 6 Sizes, 50 to 150 H.P. 125-lb. and 150-lb. steam working pressure.

For 6" rule with scale for reading pipe sizes, write Dept. 89K-XI.

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Third Annual Water Conference, Nov. 9 and 10

The following is a partial list of papers to be presented at the 3rd Annual Water Conference of the Engineers' Society of Western Pennsylvania, to be held at the William Penn Hotel, Pittsburgh, Pa., Nov. 9 and 10, 1942.

"The Use and Application of Resinous Aluminum Equipment." Dr R B Mears, research engineer, Aluminum Research Laboratories.

"Solubility of Salts in Steam at High Pressures." Prof Frederick G Straub, research professor, University of Illinois.

"Some Thoughts on the Treatment of Water for Power Plant Equipment Other Than Boilers." S E Tray, water treatment engineer, Allis-Chalmers Mfg Co, Milwaukee, Wis.

"Protection Against Embrittlement by pH Phosphate Control." By Dr S F Whirl, chief chemist, Duquesne Light Co, and T E Purcell, general superintendent of power stations, Duquesne Light Co.

"The Use and Application of Resinous Zeolite in the Water Treatment and Other Fields." By F K Lindsay, chief chemist, National Aluminate Corp.

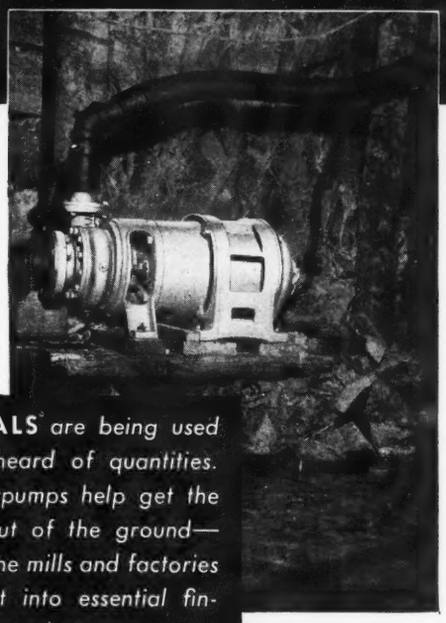
"The Use and Application of the Spiractor in Cold Lime and Soda Ash Water Softening." By S B Applebaum, vice-president, technical director, The Permutit Co.

Approved Standards

An American Standard governing letter symbols for mechanics of solid bodies has been approved and published by the American Standards Association. In addition to the 68 letter symbols approved to indicate such concepts as angular acceleration, circular frequency, factor of safety, normal strain, wave length, and the like, the new standard cites general principles of letter symbol standardization governing manuscripts, subscripts, superscripts, unlisted magnitudes and typography. The new standard was prepared by the ASA Sectional Committee on Letter Symbols and Abbreviations for Science and Engineering under the joint technical leadership of the following organizations: the American Association for the Advancement of Science, the American Institute of Electrical Engineers, the American Society of Civil Engineers, the Society for the Promotion of Engineering Education, and the American Society of Mechanical Engineers.

For 24-Hour-A-Day Pumping Service *Select the*

MOTORPUMP

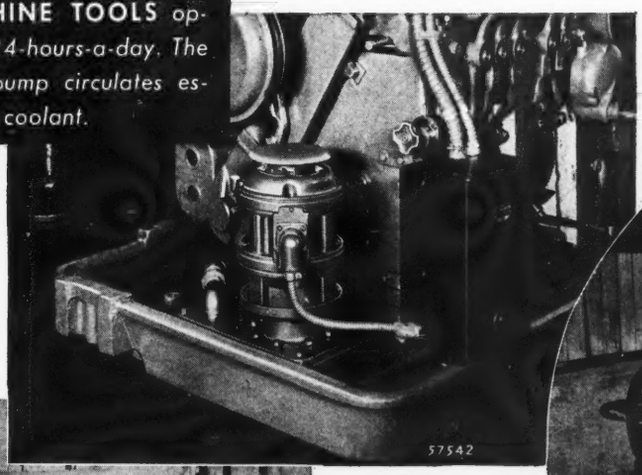


METALS *are being used in unheard of quantities. Motorpumps help get the ore out of the ground—help the mills and factories turn it into essential finished products.*

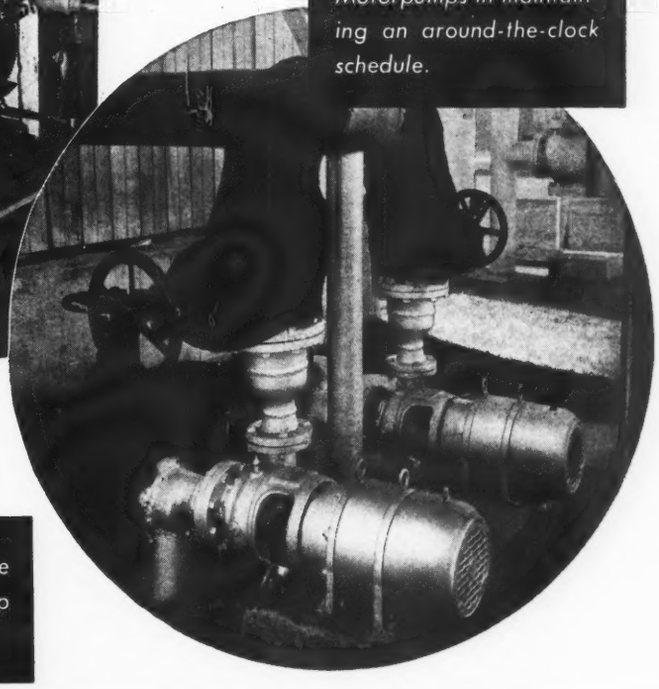
The Motorpump shaft is extra-heavy—its bearings are oversize—pump and driver are a single unit on the same shaft—the stuffing-box is deep and carefully designed. Furthermore, the Motorpump is highly efficient and unusually compact.

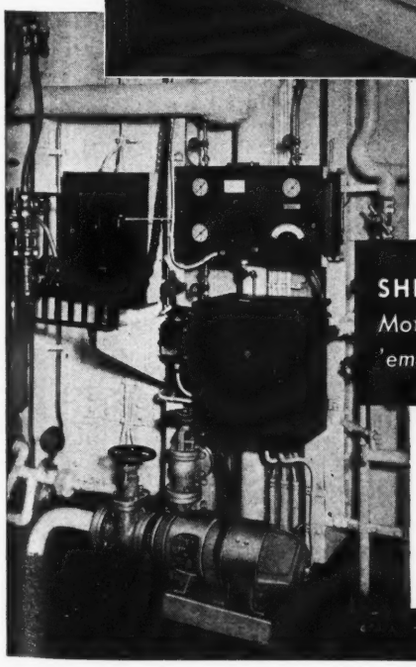
It is available in sizes to handle from 5 to 1800 gals per min at pressures up to 215 lb per sq in. Thousands of them are being used in essential production processes to bring water, gasoline, oil and a multitude of other liquids to the right place at the right time.

MACHINE TOOLS *operate 24-hours-a-day. The Motorpump circulates essential coolant.*



REFINERIES *depend on Motorpumps in maintaining an around-the-clock schedule.*





SHIPS *are vital. The Motorpump helps to keep 'em sailing*

Ingersoll-Rand

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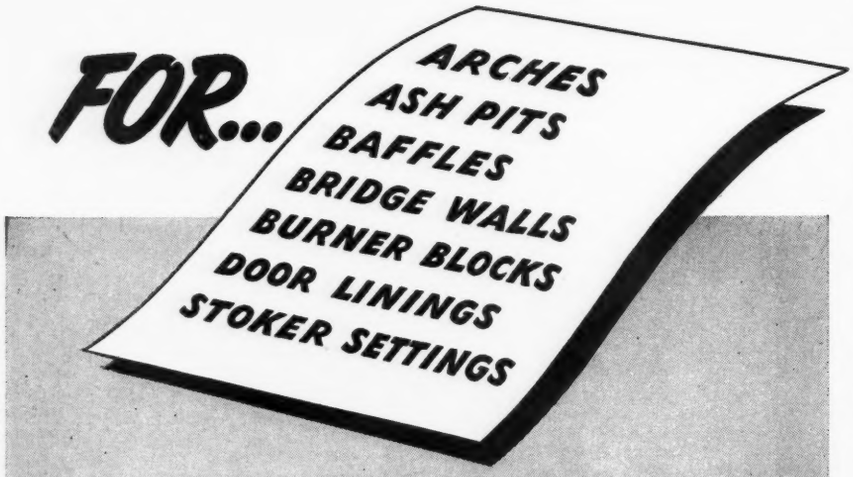


USE EASY-TO-GET CASTABLE REFRACTORIES

Jointless walls and arches are quickly cast in place, special shapes easily molded, with these ready-to-use mixtures of refractory aggregates and LUMNITE.

POWER PLANT operators keep Castable Refractories in stock for general refractory work, for emergency repairs and for making special shapes without delay.

Refractories without delay—today that's an important advantage of a Castable Refractory. You can take a bag of the dry castable, mix it with water and cast it in place. You need only a simple form for your wall or arch, a home-made mold for your special shapes. A Castable Refractory made with LUMNITE is ready for service within 24 hours after mixing.

Note these advantages of Castable Refractories:

No cutting or fitting. The Castable Refractory takes the shape of the form, mold or frame.

No ramming. After mixing with water the material is cast and simply tamped in to consolidate it.

Practically no shrinkage in drying or firing. No allowance need be made for shrinkage or expansion.

Unaffected by moisture, steam. High resistance to spalling.

▶ To get these advantages and to be assured of performance, power plant engineers specify Castable Refractories made with LUMNITE. When you buy a LUMNITE Castable Refractory, you get a ready-to-use, balanced refractory—the result of careful selection of the most suitable refractory aggregates and the hydraulic binder which made Castable Refractories possible.

Castable Refractories of different types to meet different temperature and insulation requirements are made by manufacturers of refractories and are sold by their distributors throughout the country.

The Atlas Lumnite Cement Company
(United States Steel Corporation Subsidiary)
Chrysler Bldg., N. Y. C.

Specify **CASTABLE REFRACTORIES**
MADE WITH LUMNITE

Executives Meet

Branch sales executives and the officials and engineering executives of the Cooper-Bessemer Corp met recently to discuss means of devoting company facilities with utmost effectiveness to the all-out war program, and of secondary importance, how best to return to peak-time production and markets. Conference studies included war emergency needs, research and engineering methods, substitution of materials, and user reaction as presented by sales engineers from Washington, Los Angeles, Seattle, Tulsa, Dallas, New Orleans, New York, Gloucester and every city where Cooper-Bessemer maintains district offices.

Accident Prevention Broadcast Extended

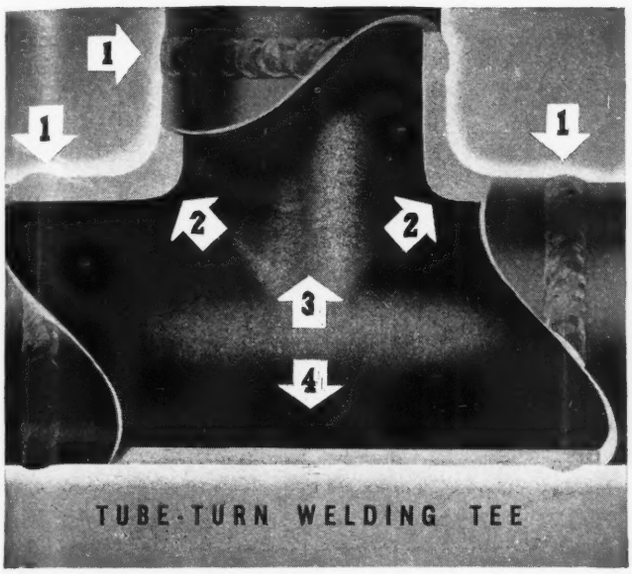
"Men, Machines and Victory," the dramatic accident prevention program, has been extended for thirteen weeks as the contribution of the Blue Network to the important war work undertaken by the National Safety Council's War Production Fund to conserve manpower. Jane Cowl opened the new series as narrator on Oct 2. As one of the country's leading industrialists, Thomas Drever, president of the American Steel Foundries, spoke for the Fund from Chicago.

Trexel and Amirikian Win Lincoln Awards

Capt C A Trexel and A Amirikian, director of planning and design, and design engineer, respectively, Bureau of Yards and Docks, Navy Department, Washington, D. C., were announced the winners of the first and second grand awards in the nationwide 2½-year $200,000 scientific welding study program sponsored by the James F Lincoln Arc Welding Foundation, Cleveland, Ohio. The 2½-year welding study, known as the "$200,000 Industrial Progress Award Program," brought forth reports of welding progress prepared by executives, engineers, designers, architects, production officials and others throughout the industrial field. The study indicated a possibility of tremendous savings in costs and man hours for production of products by arc welding for both war and peace.

"Savings in critical materials and in production costs," said Dr E E Dreese, chairman of the Lincoln Foundation, and of its Jury of Award, "reported available by arc welding in the

Why TUBE-TURN WELDING TEES provide strong, safe, easy-to-weld branch connections



TUBE-TURN WELDING TEE

(1) Easy circumferential butt welds cut installation time, make sounder, safer joints. (2) Easy sweeping curves reduce friction and pressure loss to a minimum. (3) Smooth inside walls assure even flow and add to the long life of the connection. (4) No accumulation of slag.

FABRICATED TEE

(1) Joining a branch into a main with an intersection weld makes a weaker, less sound connection. (2) Gaps and irregularities caused by uneven cutting must be filled by welder. (3) Sharp corners and jagged angles are poor piping practices. (4) Possible slag accumulation can impede flow and seriously injure valves.

8 REASONS FOR SPECIFYING TUBE-TURN WELDING TEES

1 *Extra thickness at crotch* reinforces where highest stress occurs.

2 *Reinforcement along top of run* adds needed strength here.

3 *Reinforcement on sides*—also a point of high stress gradually tapers toward end of outlet and bottom of run.

4 *Longer outlet* permits faster lining up and ample room for rod manipulation.

5 *Ends machined* to exact pipe wall thickness—easy to align and weld.

6 *Increased thickness at bottom* adds to full strength without excess weight.

7 *Smooth inside walls, curved inner crotch and special manufacturing process* assure even flow.

8 *Size, material, thickness and name* identified on permanent name-plate.

COMPARE the two cut-away illustrations above point by point for *proof* of the unmistakable superiority of welding tees.

It takes *fewer man-hours and far less trouble* to install a Tube-Turn welding tee into a piping system than to fabricate a branch connection, a vital factor in today's plant expansion and modernization for war needs. Other major advantages of these seamless welding tees are the *greater strength, longer life,* and *smooth flow* secured.

The design and construction of Tube-Turn welding tees *add to the strength of the entire piping system* by reinforcing these crucial points.

Tube Turns manufactures a complete line of welding fittings and forged steel flanges in all standard sizes and weights. Write for new complete catalog and valuable engineering data book No. 111. It's free.

TUBE TURNS, LOUISVILLE, KY.
INCORPORATED

Branch offices: New York, Chicago, Philadelphia, Pittsburgh, Cleveland, Tulsa, Houston, Los Angeles, Washington, D. C. *Distributors in all principal cities.*

TUBE-TURN
TRADE MARK
Welding Fittings

award studies, assume such proportions as to be of vital national significance."

"The figures, based on representative products and structures, show a possible annual cost saving of $1,825,000,000.

Papers were submitted to the Lincoln Foundation studies from 46 of the 48 states, by engineers, designers, architects, maintenance men and executives throughout the industrial field. Altogether, 408 awards were made to 458 recipients, the difference covering joint authorship.

The great mass of important new welding data contained in the papers will be made available as soon as possible for the benefit of war industries in the form of articles in trade publications and other magazines, and eventually in book form.

CURRENT ARMY-NAVY AWARDS

Aluminum Industries, Inc. Award presented Sept 12, 1942.

General Electric Co, Schenectady works. Award presented Sept 16, 1942.

Kewanee Boiler Corp. Award presented Aug 25, 1942.

Bonney Forge & Tool Works. Award presented Oct 2, 1942.

Chain Belt Co. Award presented Sept 19, 1942.

Woodward Governor Co. Award presented Oct 9, 1942.

Independent Pneumatic Tool Co. Award presented Oct 8, 1942.

Tube-Turns, Inc. Award presented Sept 18. (First company to receive award in Kentucky.)

Revere Copper & Brass, Inc, Dallas Div. Award presented Oct 7.

Struthers-Wells Corp. Award presented Sept 9, 1942.

Combustion Engineering Co, Inc. Hedges-Walsh-Weidner Division. (Maritime "M" Award, presented Sept 1, 1942.)

National Supply Co., Ambridge Plant. Award presented October 2.

Vilter Mfg Co. Award presented September 19.

American Machine & Metals, Inc. Award presented October 1.

International Nickel Co, Huntington Plant. Third award (two-starred "E") announced in October.

MURRAY Equipment

BOILERS
TURBO-GENERATORS
MECHANICAL DRIVE TURBINES
ENGINES
UNIT HEATERS
GEARS
★★★

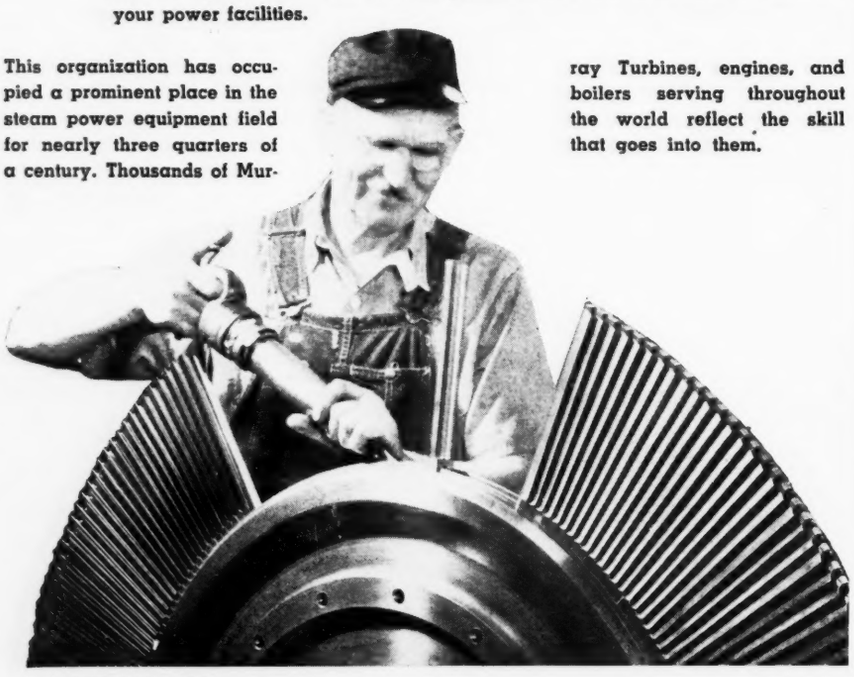
IS HELPING INDUSTRY STEP UP ITS

POWER CAPACITY

Power always has been and always will be the basis of production. Murray Equipment is closely linked with the production of power. Therefore, at the start, our engineering ability and production facilities were centered on designing and building power equipment that would make definite contributions to smooth production and to day-by-day economy. Murray Equipment that was in service at the beginning of industry's victory production efforts were readily capable of meeting stepped up requirements.

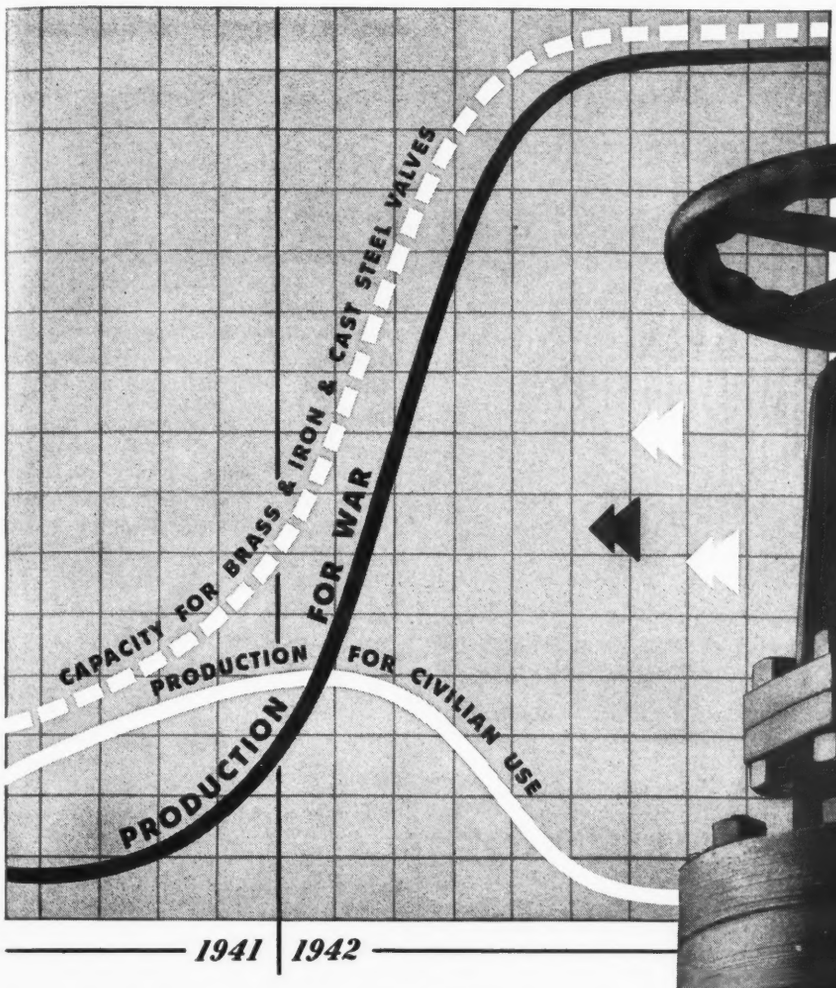
Today we are filling Victory orders as quickly as possible—getting Murray Equipment out where it will do the most good. Your priority rating may not entitle you to quick delivery of Murray Equipment but in anticipating the future, now is a good time to look into the possibilities of this equipment as concerns your power facilities.

This organization has occupied a prominent place in the steam power equipment field for nearly three quarters of a century. Thousands of Murray Turbines, engines, and boilers serving throughout the world reflect the skill that goes into them.



BOILERS TURBINES ENGINES

MURRAY
IRON WORKS COMPANY
INCORPORATED 1870
BURLINGTON IOWA

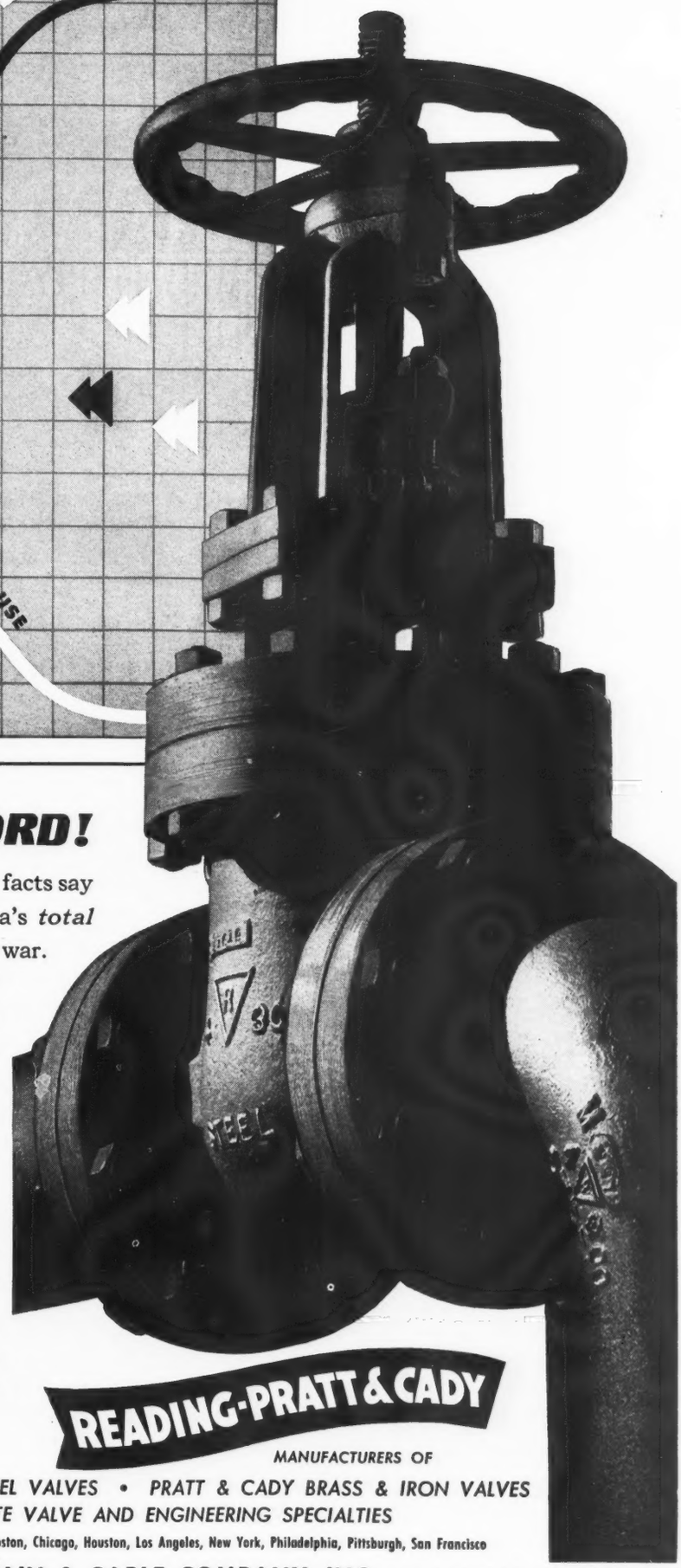


HERE'S THE RECORD!

Men whose opinions are supported by the facts say that we can lose this war unless America's *total* effort is given to producing the needs of war.

The above chart pictures **READING-PRATT & CADY'S** answer to that challenge. And almost all of you who look to us for your valves have agreed that by giving every ounce of effort to war production, we are loyal to your own best interests. Remember that, won't you?

And remember, too, that when **READING-PRATT & CADY VALVES** are again freely offered to you they will be the product of men who have learned much under the pressure of 'round-the-clock production of the kind of valves on which Americans at war could stake their lives.



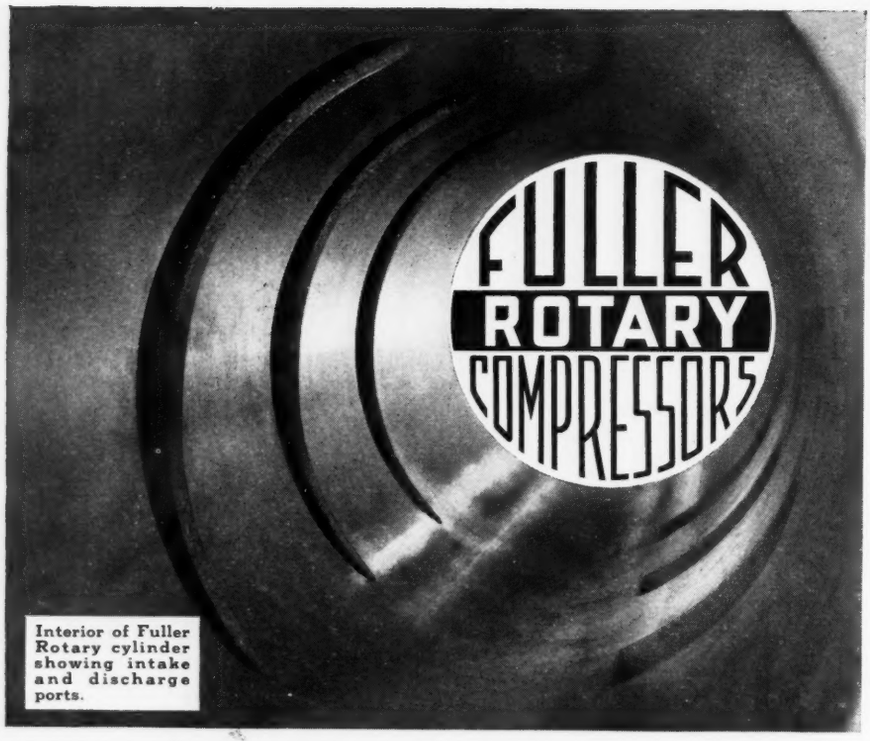
READING-PRATT & CADY

MANUFACTURERS OF

READING CAST STEEL VALVES • PRATT & CADY BRASS & IRON VALVES
D'ESTE VALVE AND ENGINEERING SPECIALTIES

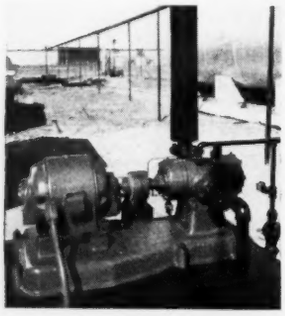
Reading, Pa., Atlanta, Boston, Chicago, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco

A DIVISION OF **AMERICAN CHAIN & CABLE COMPANY, INC.,** BRIDGEPORT, CONNECTICUT



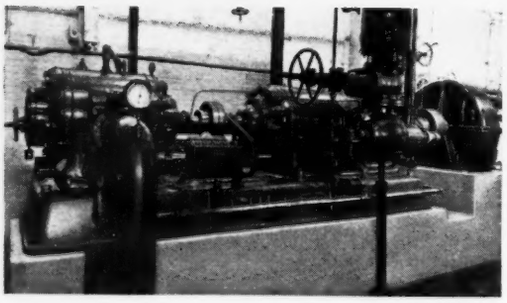
Interior of Fuller Rotary cylinder showing intake and discharge ports.

SIMPLIFIED DESIGN . . .
RUGGED CONSTRUCTION



For many years Fuller engineers have striven to build the best compressor money could buy . . . simple in design, easy to operate, ruggedly constructed for long, continuous service at minimum operating expense.

This continued effort has paid dividends, as is attested by the hundreds of machines in daily operation and the many repeat orders from satisfied customers.



Before purchasing your next compressor, get in touch with us. Send for Bulletin C-5 and become better acquainted with these modern, efficient machines.

Fuller Rotary Compressors are built for capacities to 1800 c.f.m., pressures to 125-lb. gauge. Vacuum Pumps — for vacuums to 29.90-in. (referred to 30-in. barometer).

FULLER COMPANY
CATASAUQUA, PENNSYLVANIA

Chicago: 1144 Marquette Bldg. San Francisco: 420-421 Chancery Bldg. C-75

FULLER
PIONEERS OF HIGH-EFFICIENCY ROTARY COMPRESSORS

From information received during the past month, POWER *here presents a brief summary of power men who have left their business positions to enter the armed services:*

Rupert A Chaffee, from Clark Bros Co, Inc. to Second Lieutenant, Army Air Corps, Technical Training Command.

Perry R Cassidy, from executive assistant, the Babcock & Wilcox Co, to Lieutenant-Colonel, Engineer Corps, U. S. Army.

R E Lewis, from sales correspondent, Akron office, B F Goodrich Co, to Chief Petty Officer, U. S. Navy.

R Burge, from sales correspondent, New York district, B F Goodrich Co, to Officers Training Camp.

Electric Furnaces Play Vital Role

Industrial Electric furnaces have a vital role in the war and production of the devices was 16 times greater during the first six months of 1942 than during any pre-war half year, according to C L Ipsen, manager of electric heating sales for General Electric.

"Prior to World War I, electric furnaces were used mainly in laboratories, but they were speedily adapted to war." Mr Ipsen said. "Today they are playing a leading role in heat treating thousands of different parts and subassemblies for war devices of all kinds. By plant expansion and by working around the clock, however, makers of electric furnaces are supplying the demand for facilities.

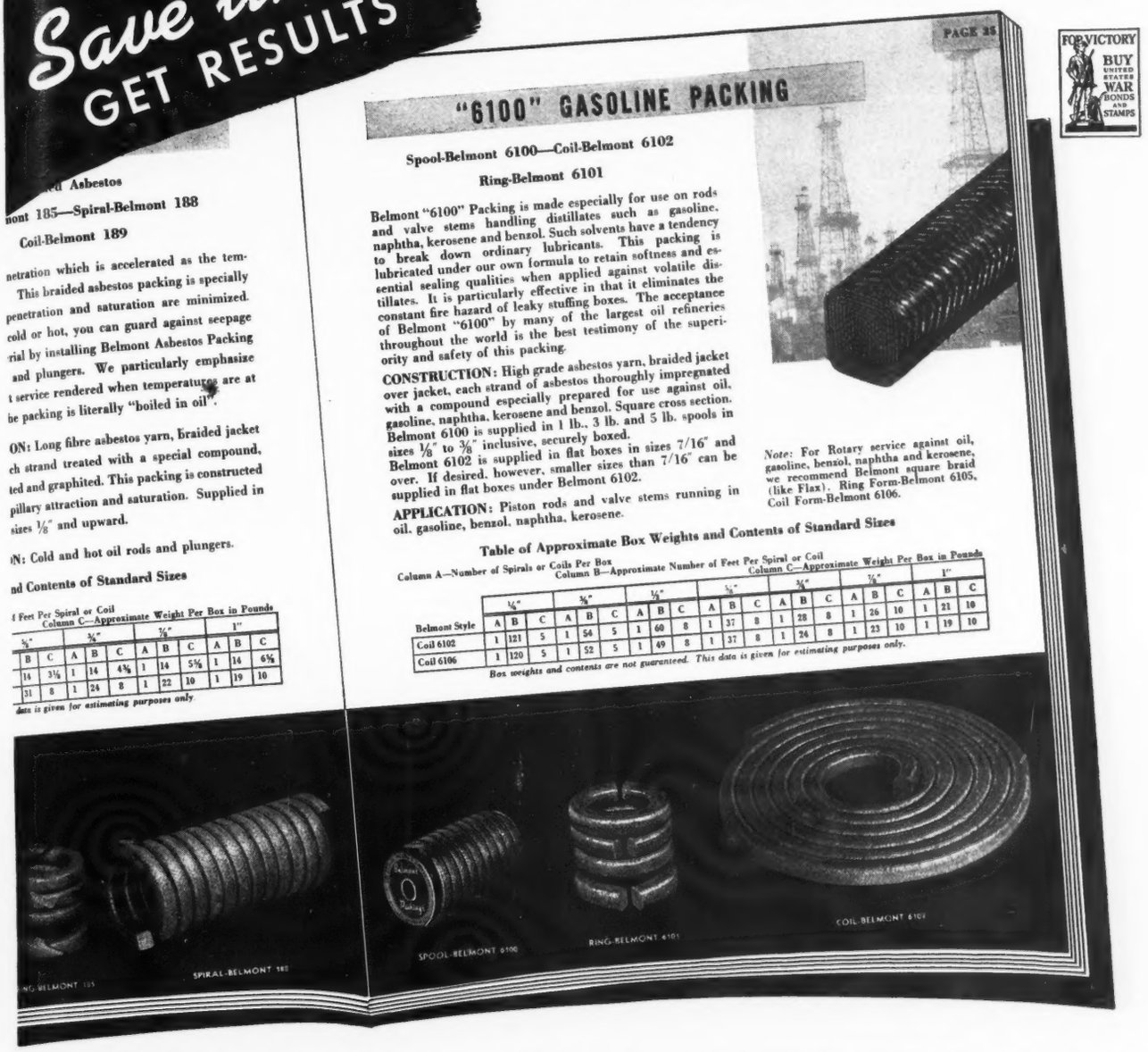
One of the most recent wartime applications of electric furnaces is in annealing steel cartridge cases. This use of steel as a substitute for brass, now scarce, has created a new demand for electric annealing furnaces.

Before the war was over, the company installed several cylindrical-shaped pit furnaces into which large gun barrels were lowered for heat treating."

Following the war, as the manufacture of high grade consumer products

Use the Belmont Packing Catalog to Solve Your Packing Problems

Save time.. GET RESULTS


PAGE 35
"6100" GASOLINE PACKING
Spool-Belmont 6100—Coil-Belmont 6102
Ring-Belmont 6101
Belmont "6100" Packing is made especially for use on rods and valve stems handling distillates such as gasoline, naphtha, kerosene and benzol. Such solvents have a tendency to break down ordinary lubricants. This packing is lubricated under our own formula to retain softness and essential sealing qualities when applied against volatile distillates. It is particularly effective in that it eliminates the constant fire hazard of leaky stuffing boxes. The acceptance of Belmont "6100" by many of the largest oil refineries throughout the world is the best testimony of the superiority and safety of this packing.
CONSTRUCTION: High grade asbestos yarn, braided jacket over jacket, each strand of asbestos thoroughly impregnated with a compound especially prepared for use against oil, gasoline, naphtha, kerosene and benzol. Square cross section. Belmont 6100 is supplied in 1 lb., 3 lb. and 5 lb. spools in sizes 1/8" to 3/8" inclusive, securely boxed.
Belmont 6102 is supplied in flat boxes in sizes 7/16" and over. If desired, however, smaller sizes than 7/16" can be supplied in flat boxes under Belmont 6102.
APPLICATION: Piston rods and valve stems running in oil, gasoline, benzol, naphtha, kerosene.
Note: For Rotary service against oil, gasoline, benzol, naphtha and kerosene, we recommend Belmont square braid (like Flax). Ring Form-Belmont 6105, Coil Form-Belmont 6106.
Table of Approximate Box Weights and Contents of Standard Sizes
Column A—Number of Spirals or Coils Per Box
Column B—Approximate Number of Feet Per Spiral or Coil
Column C—Approximate Weight Per Box in Pounds
Box weights and contents are not guaranteed. This data is given for estimating purposes only.
SPOOL-BELMONT 6100
RING-BELMONT 6101
COIL-BELMONT 6102
SPIRAL-BELMONT 188

NOT JUST ANOTHER CATALOG—but a packing reference book prepared by packing manufacturers. 84 pages of packing information, all reduced to its simplest form; with each and every type of Belmont packing clearly illustrated and described—as shown in the facsimile page above.

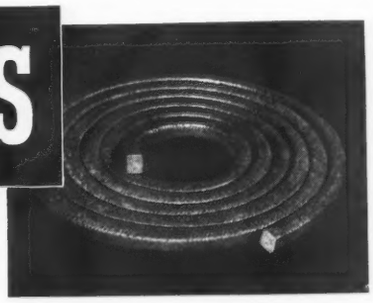
The Belmont Packing Catalog includes recommendation charts that enable you to check instantly, by type of service, Belmont's choice of packing styles (listed in the order of our selection). Packing end views are pictured in large size showing minute details. Construction, applications, tables of weights and measures are all laid out in easily readable form so that everything can be taken in at a glance.

The Belmont Packing Catalog is a time-saver, a book you should not be without. Write on your Company letterhead for your copy today.

There's a Belmont Packing for every service: Steam, Water, Oil, Gas, Air, Acid, Alkalies, Ammonia. Forms include: Rings, Coils, Spirals, Reels, Spools, Sheets, Gaskets.

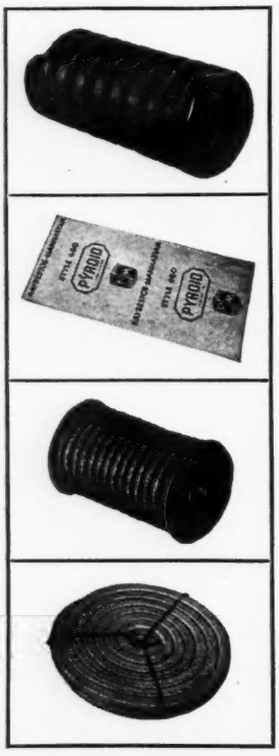
Belmont Packings are Sold by Authorized Belmont Distributors in Every Large Industrial Center

BELMONT PACKINGS



THE BELMONT PACKING & RUBBER COMPANY
Dept. P-1142
Butler and Sepviva Streets Philadelphia, Pa.

Industry's "Trained Seals"..



Yes, they're trained to *seal* steam lines, oil lines, fuel lines, and air lines against leaks or blowouts. And how they perform! Even under the higher pressures demanded by total production, R/M packings *hold that line* better than ever before, and for longer periods.

R/M engineers burn the midnight oil in their laboratories in a constant endeavor to make R/M packings the toughest, tightest seals that ever kept power where it belongs . . . in the line and not outside of it. "R/M" means Raybestos-Manhattan, Reliable Merchandise!

Do you have a copy of the R/M catalog? It's keyed for applications, illustrated, and indexed as to materials and types. Get a copy from your R/M distributor, or write us direct.

INDUSTRIAL SALES DIVISION
RAYBESTOS-MANHATTAN, INC.
MANHEIM, PA.
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Makers of Packings for Every Industrial Use

such as ranges, refrigerators, typewriters, and automobiles expanded on a mass production basis, the commercial application of electric furnaces developed steadily. As the years passed, new types of furnaces, adaptable for ever-widening applications, came into being. Today furnaces with time and temperature automatically controlled to insure accuracy and uniformity are in wide use. Certain types have cycle arrangements whereby a complete process can be repeated by an automatic timer.

Nearly all metals require heat treating, either in the raw material state or later in the more nearly finished state, or both. The valuable properties of alloys are developed by the proper application and control of heat. This heat treatment is essential to the uniformity of individual pieces being turned out in great volume.

Electric furnaces, small in size, were first used in laboratories to provide careful control under exacting experimental conditions. Production during World War I, however, demanded speedy and accurate heat treatment on an extensive scale.

The Salvage Story

by PAUL C CABOT
Deputy Chief
Conservation Division
War Production Board

To move every pound of critically-needed waste materials into the flow for the manufacture of implements of war, is the over-all objective of the Salvage Branch of the Conservation Division, WPB. To make every man, woman and child in America conscious of this need, and to secure the active cooperation of every American to "get in all the scrap—NOW," is equally important.

The steel mills of America are doing a grand job to keep our war production on the schedule established by Donald Nelson. However, it was divulged at the Newspaper Editors' Meeting in Washington that there is an inadequate inventory of iron and steel scrap in the hands of consumers.

It has been determined that if our production schedule is to be maintained, 17,000,000 net tons of purchased iron and steel scrap are wanted in the second half of 1942 to give the iron and steel furnaces sufficient inventories to prevent shutdowns when the cold weather sets in.

The War Production Board, through its Salvage Branch, approaches this problem of "getting in the scrap" in four major directions: namely through

Helping to CREATE CAPACITY *for* GREATER PRODUCTION *by* *Eliminating* WASTE

★ **CORRECT FUEL FEED**
You Save **COAL, OIL OR GAS**

★ **PROPER AIR SUPPLY**
YOU BURN FUEL *Economically*

★ **CONSTANT OVER-FIRE DRAFT**
You Prevent **UNDUE STACK LOSS**

FURNACE DRAFT CONTROLLER
This CASH STANDARD Furnace Draft Controller (which comes complete with Operating Power Cylinder) works from overfire draft, regulating the boiler uptake damper to maintain a constant draft in the combustion chamber.

CASH STANDARD

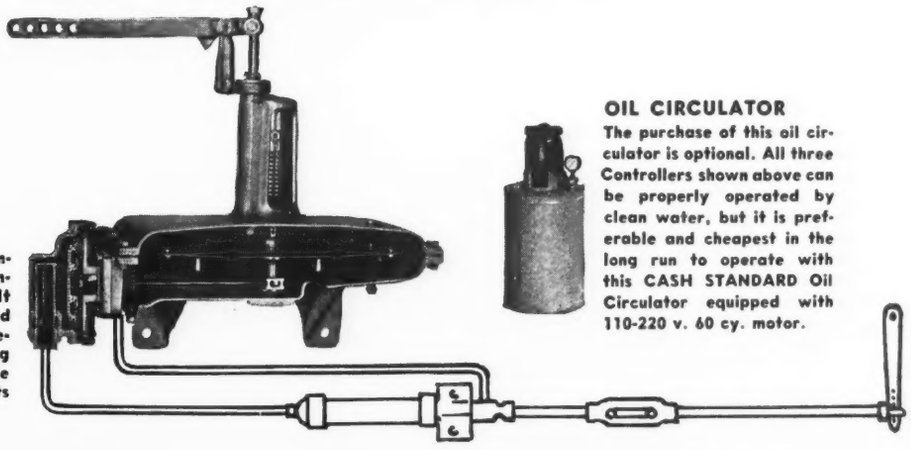
AUTOMATIC COMBUSTION CONTROL SYSTEMS

BOOST YOUR BOILER OUTPUT

• Keeping fuel consumption low is one effective conservation job being done by CASH STANDARD Automatic Combustion Control Systems. Accomplishing this and yet boosting boiler output adds another to the important CASH STANDARD results. The fuel requirements for a given load are reduced because the rate of fuel feed is adjusted exactly to the need — you eliminate fuel waste.

CASH STANDARD units, which make up the systems, are available in a number of variations and can be applied in all plants from the very largest to those as small as 75 boiler horsepower. Bulletin 300 gives full details on application and operation — tells about maintenance savings and why you can hold steam pressure to within very close limits.

FUEL FEED CONTROLLER
This CASH STANDARD Master Controller automatically regulates fuel feed. Locate it conveniently. Working from boiler pressure, it will adjust the rate of combustion by regulating the rate at which fuel (any kind of fuel) is supplied to the boiler furnace. And it will adjust the Air Flow Controller so the correct amount of air is supplied for proper combustion — hence, money saving.



AIR FLOW CONTROLLER
This CASH STANDARD Air Flow Controller meters the air needed for combustion. Install it near its damper. It is not affected by changes in fuel bed resistance or any other variables, because it meters air supply according to the differential pressure through the gas passages of the boiler, doing its part to insure perfect combustion.

OIL CIRCULATOR
The purchase of this oil circulator is optional. All three Controllers shown above can be properly operated by clean water, but it is preferable and cheapest in the long run to operate with this CASH STANDARD Oil Circulator equipped with 110-220 v. 60 cy. motor.

A. W. CASH COMPANY
DECATUR, ILLINOIS

CASH STANDARD
CONTROLS . . VALVES

Protect against spalling and cracking

by ARMOR PLATING REFRACTORY LININGS with

BRICKSEAL

By forming a highly glazed semi-plastic surface over refractories, BRICKSEAL seals pores, completely stops infiltration of gases and carbon and minimizes the cause of spalling and cracking.

BRICKSEAL is a combination of high fusion clays and metals combined in oils. It is unaffected by gases, acids or alkalis and is *guaranteed* not to crack, peel or blister under a wide range of temperatures.

EASILY APPLIED TO ANY SURFACE

Any refractory surface may be "armor plated" with BRICKSEAL which can be applied by air-spray gun or by hand brush quickly and easily. A proper BRICKSEAL application stands up effectively from one to four years. Ideal for new construction or maintenance requirements. Tried and proved in every type of boiler under all conditions.

INVESTIGATE TODAY

—by sending for complete details.

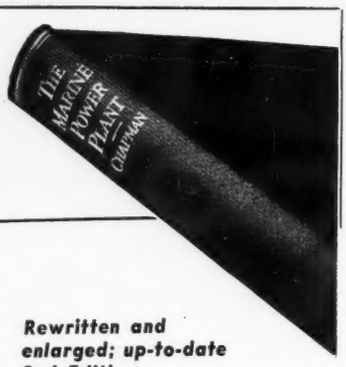
ATTENTION DISTRIBUTORS

Desirable openings are available for sales representation in certain territories. Write for details.

BRICKSEAL REFRACTORY CO.

1029 Clinton St., Hoboken, N. J.

How to design economical, efficient marine power plants



This book gives an engineering treatment of marine power plant equipment, the requirements of applying it economically and efficiently, and design methods, calculations, and data—in concise, clear form, with many details and pointers to help both the engineer who wishes a quick introduction to the working fundamentals of this field, and owners, seagoing engineers, and others interested in effective selection and use of machinery.

Rewritten and enlarged; up-to-date 2nd Edition

THE MARINE POWER PLANT

By **L. B. Chapman**, Professor of Marine Transportation and Marine Engineering, Massachusetts Institute of Technology.
402 pages, 6 x 9, 130 illustrations, $4.00

All these features to give you better working knowledge of plant equipment, layout, design, and operation

- stress on fundamental principles, thermodynamic and economic features of marine power plants, plus description of boilers, drives, auxiliaries, etc., methods of employing them, and design calculations and data
- treatment of fuels and combustion, including Diesel oils, pulverized coal, factors of increasing efficiency, etc.
- comparison of all important types of propulsion machinery, on all points affecting engineering and economic effectiveness for particular installations
- complete design procedure and calculations for typical marine power plant steam systems; one for ship fitted with steam auxiliaries and one for ship fitted with motor driven auxiliaries and using extracted steam for feed heating
- section on thermodynamics for those requiring review of this background

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Send me Chapman's The Marine Power Plant for 10 days' examination on approval. In 10 days I will send $4.00, plus few cents postage, or return book postpaid. (Postage paid on orders accompanied by remittance.)

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Company .....P. 11-42

1) The Industrial Salvage Section, which is charged with the responsibility of educating industry to salvage all critical waste materials, to speed up the return of these materials into the War Production stream and to help industry to use established channels of disposal.

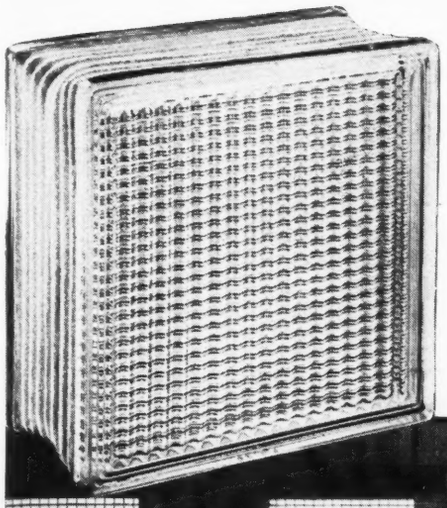
The present immediate objective of the section is to urge and assist the executive management of every industrial establishment in the country to locate, classify and move into war production channels all dormant and production scrap in their possession as speedily as possible. "Dormant" scrap is defined as obsolete machinery, tools, equipment, dies, jigs, fixtures, etc, which are incapable of current or future use in the war production effort because they are broken, worn-out, irreparable, dismantled or in need of unavailable parts necessary to practical re-employment.

Hamilton W Wright, Chief of the Industrial Salvage Section, says to industry: "Worn-out, unusuable material, machinery and equipment must be reborn in America's furnaces, smelters and refineries. Only by this method can we obtain sufficient raw materials required to produce urgently needed armament for our fighting forces."

Representatives of the Industrial Salvage Section in all parts of the country are urging industrial firms to appoint an executive as salvage director, put into motion a practical, continuing salvage campaign and to adopt the policy—"If it hasn't been used for three months, and if someone can't prove that it's going to be used in the next three—find a use for it or scrap it."

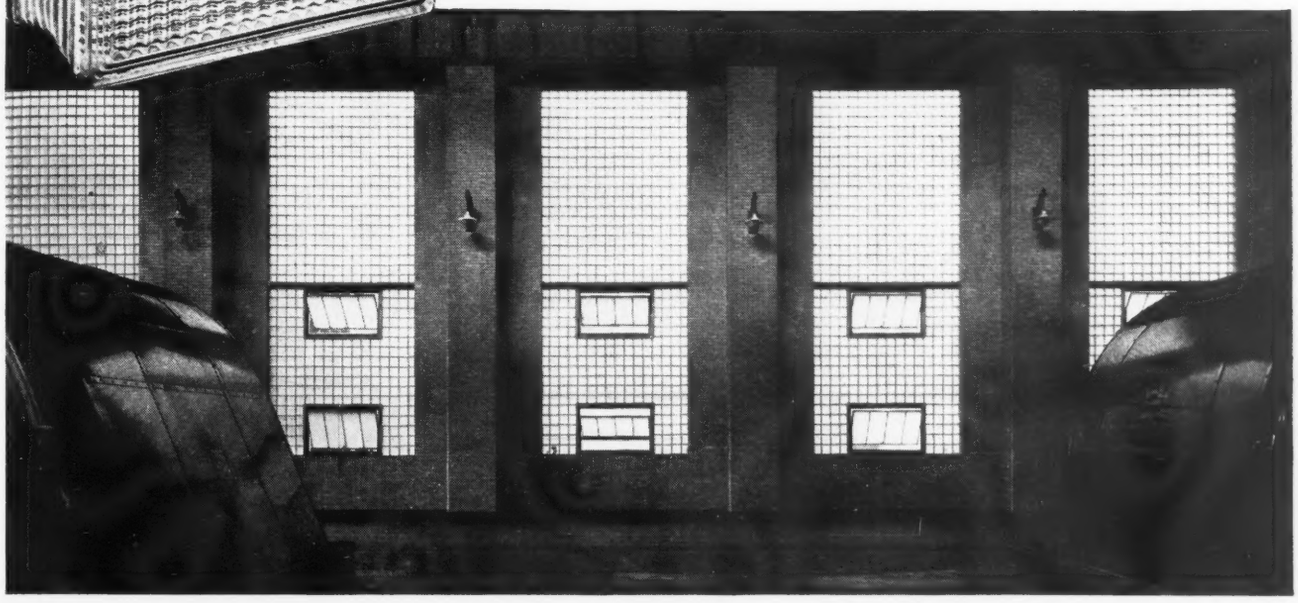
2) The General Salvage Section is charged with establishing salvage programs in local community areas, appointing local committees and directing their activities. Their salvage operation extends to every household including farms, all retail stores, garages, hotels, small businesses and the smaller industrial organizations in rural areas.

The General Salvage Section, aided by the farm implement manufacturers, has created a well conceived plan to harvest all the scrap from every farm in the country. A far reaching campaign which will involve all the teachers and school children of the country has already been put into action and will extend its influence in every home in the country. The oil, rubber, automotive and steel industries and their dealers, as well as numerous other private and public agencies, are working through some 12,500 state and local salvage committees in their efforts.

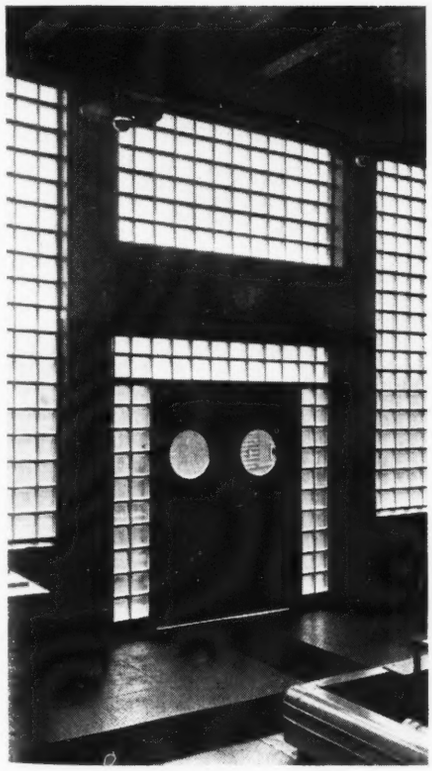


A Proven Way to Banish Many Maintenance Worries

REPLACE FAULTY WINDOWS WITH INSULUX GLASS BLOCK



Insulux Panels Are Installed with Minimum Metal



You need not put up with worn-out windows. Replace them, as so many plants are doing, with INSULUX Glass Block.

You can install INSULUX *daylight* panels with *almost no metal*—which aids the war effort. Small panels need no wall ties; larger panels need few.

You'll have a plant evenly daylighted—effectively protected from dust infiltration.

Maintenance costs are extremely low on INSULUX panels. There's no appreciable deterioration of the sturdy, 4-inch-thick hollow glass block and mortar. INSULUX panels never need painting. You can *wipe* the tallest panels clean with a rag or sponge on a long pole.

INSULUX Glass Block are fireproof—noncombustible. They insure privacy and are good protection against saboteurs.

INSULUX Glass Block are immediately available at prewar prices. Mail the coupon for more information on INSULUX.

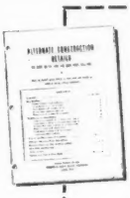
OWENS-ILLINOIS

INSULUX

GLASS BLOCK

FREE BOOK

with detail drawings and photographs showing installation of INSULUX with little or no metal. Mail the coupon—get the facts.



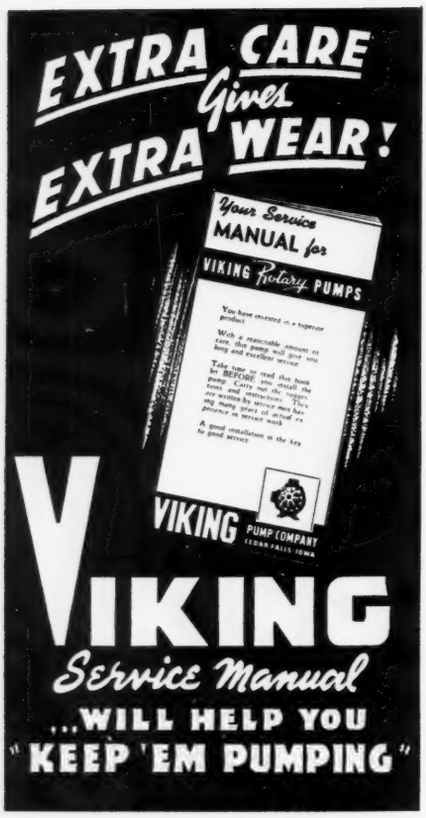
OWENS-ILLINOIS GLASS COMPANY,
INSULUX Products Division,
Department 78, Ohio Bldg., Toledo, Ohio.

Gentlemen: Please send your free book of details on installing INSULUX with minimum metal.

Name _____

Address _____

City _____ *State* _____



Many years of experience have produced the helpful, money-saving information and instructions in the Viking Service Manual. It's a handy, illustrated booklet that gives you practical suggestions how to install, operate and maintain Viking Rotary Pumps. Right now pumps are hard to get. So it pays to give your pumps *extra* care to get *extra* wear. Write today for your copy of the Viking Service Manual. It's FREE.

★

Please . . . Don't FORGET

When ordering pumps or parts, it is necessary that you give us your priority rating and allocation symbol. Be sure to obtain the highest rating possible. Priority regulations are changed frequently. Check up to see if changes made improve your rating. Thank you.

★

VIKING
PUMP COMPANY
CEDAR FALLS, IOWA

The newspapers of the country have assumed the responsibility of vitalizing all of these activities.

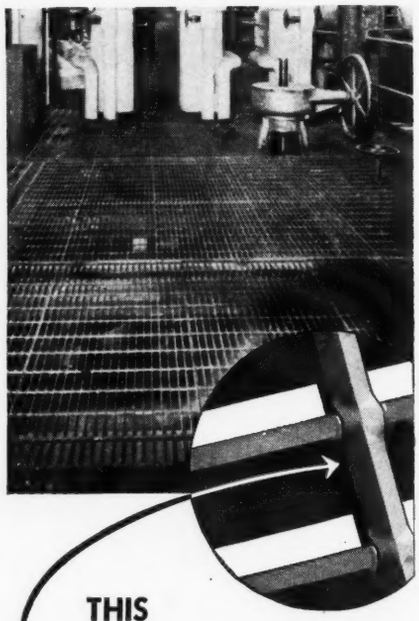
3) The Special Projects Salvage Section is responsible for salvaging large accumulations of secondary and waste materials that are tied up due to financial, legal, political, and other reasons and which cannot be quickly handled by other Sections in the normal course of operation. Special projects include such things as abandoned railroads, streetcar lines, factories, bridges, etc. Recently the Metals Reserve Company, at the request of the Conservation Division, set up an organization entitled War Materials, Inc, for the purpose of salvaging iron and steel scrap which cannot be topped within existing price ceilings. War Materials, Inc will work in cooperation with the Special Projects Section and it is expected that the tonnages of so-called marginal scrap will greatly expand as a result of this new organization.

4) The Automobile Graveyard Section, now working through 254 field representatives, has the responsibility to see that 20,000 graveyards in the United States are functioning as producing units. With the help of the steel industry, nearly all the regions in the country have been placed on a 60-day plan, which means that the dealers and brokers have been told that graveyards have been informed that they must break up and sell their inventory within the same period. It is essential to keep these graveyards as operating scrap-producing units. Most people mistakenly believe that best results are obtained by the elimination of automobile graveyards. In view of the fact that anywhere from 1,000,000 to 2,500,000 cars annually come off the roads and enter graveyards, it is essential that they be kept in operation as an important continuing source of scrap metal supply. To keep these operations in existence it is as essential that they have an adequate inventory as it is that any other industry maintain a reasonable inventory.

Reading, Pa., Holds Power-Saving Conference

The first Power-Saving Conference to be sponsored by a municipality was held in Reading, Pa., on October 8, under the auspices of Power Engineers and Manufacturers' Association. It was attended by prominent engineers, industrialists, and representatives from national industrial publications.

E L Seasholtz, president, Manufacturers' Association of Reading, called



THIS SCRAPER TREAD OF
BATES-GRATES
OPEN STEEL FLOORING
GIVES THE
COMBINATION OF SAFETY AND CLEANLINESS
YOU WANT IN OPEN STEEL FLOORING

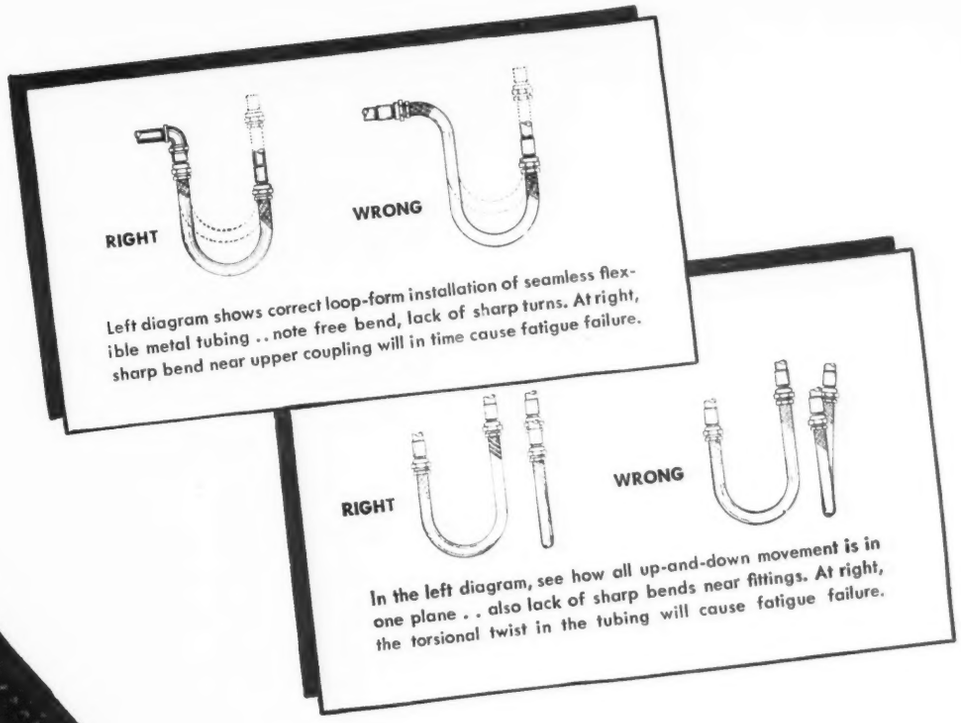
This extra cleanliness and safety come with the use of welding technique that, for years, has been recognized as the correct method to follow—a simple fillet weld.

There is no burning and no overflow of surplus metal around the fillet into which is press-welded Bates Hex Bar Stock. You get top strength and rigidity in steel flooring that permits the maximum passage of air and light.

Write for the new catalog "FILLET WELD BATES - GRATES" that gives complete details—well illustrated to show how advantages of this open steel flooring can be used in your plant.

WALTER BATES COMPANY, INC.
208 S. LA SALLE STREET • CHICAGO, ILLINOIS
OPEN STEEL FLOORING, STAIR TREADS, FLOOR ARMOR AND BRIDGE DECKING

How to get long life from Seamless Flexible Metal Tubing


RIGHT
WRONG
Left diagram shows correct loop-form installation of seamless flexible metal tubing .. note free bend, lack of sharp turns. At right, sharp bend near upper coupling will in time cause fatigue failure.
RIGHT
WRONG
In the left diagram, see how all up-and-down movement is in one plane . . also lack of sharp bends near fittings. At right, the torsional twist in the tubing will cause fatigue failure.

PROLONGING the life of equipment today is more than just a dollars and cents practicality . . . equipment like American Seamless and other American Metal Hose products is almost priceless, very often irreplaceable until the war is won.

Correctly installed, American Seamless Flexible Metal Tubing can be counted on for lower costs and invaluable durability in numerous applications—such as conveying steam, liquids and gases, for controlling vibration and for connecting misaligned or moving parts.

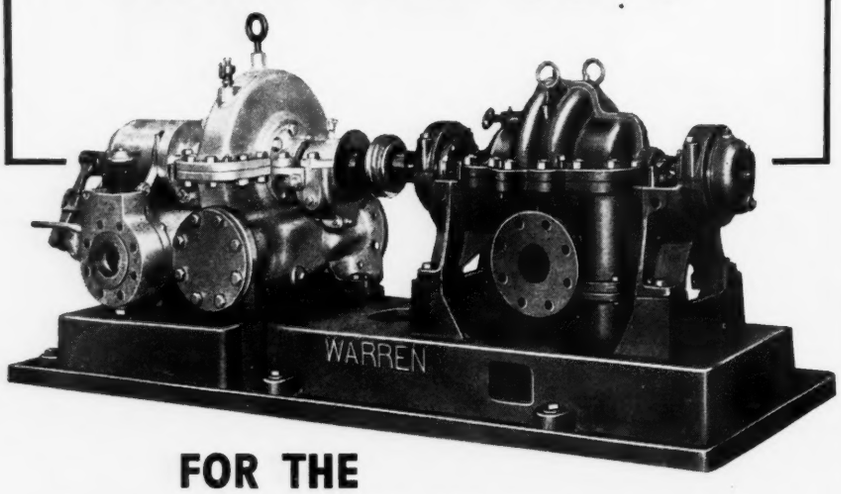
The "right and wrong" of two important installation factors are shown above. There are others equally important—minimum bending diameters and overall lengths, and support for horizontal installations. Complete information will be found in our Bulletin SS-M, free on request. 42188

ANACONDA
from mine to consumer

American Metal Hose

AMERICAN METAL HOSE BRANCH of THE AMERICAN BRASS COMPANY
General Offices: Waterbury, Conn. • *Subsidiary of Anaconda Copper Mining Company*

WARREN PUMPS HAVE "THE GUTS"



FOR THE TOUGHEST JOBS IN YOUR PLANT

It takes real "guts" to stand up under today's gruelling production schedules—and Warren Pumps have got plenty of what it takes. They were designed, engineered and constructed to work 24 hours a day, 7 days a week—*year after year.*

The records that Warren Pumps are establishing for performance and economy are possible because Warren Pumps have *good details.* Consider a few: liberal clearances between impeller and case rings . . . extra-heavy shafts . . . oversize bearings . . . bread-faced case rings . . . properly proportioned liquid passages.

Get in touch with our engineering department if you have a pumping problem. Remember—"A Warren Recommendation Is Never A Compromise."

WARREN STEAM PUMP COMPANY, INC.

WARREN, MASSACHUSETTS

the conference to order. Thomas K Leinbach, production manager, Vanity Fair Silk Mills, and master of ceremonies, introduced Francis A Heine, chief engineer, Bureau of Water of the City of Reading, who outlined the importance of water leaks and the vital part they play in the industrial conservation picture.

Kenneth Buzby, lubricating engineer, Keystone Lubricating Co, presented examples which showed how proper lubrication can be responsible for a great increase in power recovery. Speaking on "Power Waste in Industry," G R Parry, Metropolitan Edison Co, gave opinions of all phases of electricity and its relationship to the power-conservation plan. An open discussion followed.

The conference was a result of the Gilmer National Power Recovery Plan, originated by the L H Gilmer Co, Philadelphia, Pa. The plan (see POWER, July, 1942, pg 128; and Sept, 1942, pg 111) provides a method for detecting and high-lighting power leaks; for focusing executive attention on the waste involved; and for securing the necessary action to get the waste reduced in the most feasible locations.

H L Watson New Head of De Laval Company

H L Watson, since 1934 Executive Vice-President and Director of the De Laval Steam Turbine Company, Trenton, New Jersey, has been elected to the Presidency of that Company, succeeding Francis J Arend, who died August 24, 1942. From 1913 to 1934, Mr Watson was General Sales Manager. He graduated from Rose Polytechnic Institute, Terre Haute, Ind., in 1905 and served as erecting engineer and later as sales engineer, specializing in steam turbine work, with the Allis-Chalmers Company until he entered the employ of the De Laval Company.

Col. Stilwell Joins American Standards Assn

Colonel John Stilwell has just been elected to serve a three-year term on the Board of Directors of the American Standards Association.

Colonel Stilwell is serving his third term as president of the National Safety Council. He has also served as president of the Greater New York Safety Council and of the American Museum of Safety. He has for many years been interested in the development of safety standards as a means of preventing accidents. He was a member of the Safety Code Correlating Committee of the

1820 EXTRA HOURS between "SHUTDOWNS"!

SOLNUS OILS

Reduce Generator-Diesel "Time Outs" 50%

Before changing to Solnus Oil for lubrication, two 8-cylinder diesels, driving generators in a large institution, required overhauling at least twice each year . . . due to excessive formation of hard carbon.

Since the switch to Solnus Oils these diesels have been overhauled only once a year . . . are operating 1820 extra hours between shutdowns . . . and they haven't had a single piston ring failure due to faulty lubrication.

Sun Solnus Oils are the result of scientific research to develop an oil that will stand up in diesel service. They are wholly distilled, neutral in acidity, low in carbon content and extremely durable.

Let Sun Engineers—those Doctors of Industry — and Solnus Oils help you to achieve better diesel performance and lower maintenance costs . . . just as they have helped other diesel operators. Write . . .

SUN OIL COMPANY • PHILADELPHIA

Sponsors of the Sunoco News Voice of the Air—Lowell Thomas

SUNOCO

SUN PETROLEUM PRODUCTS.. HELPING INDUSTRY HELP AMERICA

VAR BONDS
STAMPS

STOP

these

"Power Saboteurs"!

Scale . . . . Sludge . .

Corrosion . .

Embrittlement . .

Foaming . .

Carryover . .

with

SUHM

Individualized

BOILER WATER TREATMENT . . .

Wartime is no time for power losses, boiler shutdowns, boiler repairs, high fuel bills, boiler explosions! It's needless "Power Sabotage" that SUHM INDIVIDUALIZED BOILER WATER TREATMENT can help you LICK.

SUHM BOILER WATER TREATMENT, based on scientific and thorough analysis of your INDIVIDUAL needs, has been saving thousands of dollars for Power Plants for over 40 years. Today, the power to produce more weapons of war DEPENDS on it.

Put SUHM Service to work in YOUR Plant! It's complete—PERMANENT. Covers scientific analysis, treatment, recommendations for conditioning, blow-off and all the other details of helping you to greater power-efficiency.

RETURN THE COUPON . . . TODAY!

SUHM Individualized WATER TREATMENT . . . for Power and Processing, and Specialized Cleaning Problems.

SUHM COMPANY, Inc.
1942-50 S. Kinnickinnic Av.
Milwaukee, Wisconsin

Please send us a shipping container for returning a sample of our Raw Boiler Water for Analysis and a suggested formula of SUHM BOILER WATER TREATMENT.

Name .....

Address .....

City..... State.....

American Standards Association in the early days of safety standardization work.

As General Superintendent of Transportation and later Vice-President of the Consolidated Edison Company of New York, Colonel Stilwell has had a good deal to do with the safety program of that company.

Colonel Stilwell was Assistant Chief of Staff of the 4th Army Corps during the last war. He is a brother of Lt General Stilwell, who is in charge of American forces in China.

Ickes, Davies, Eastman To Address Oil Men

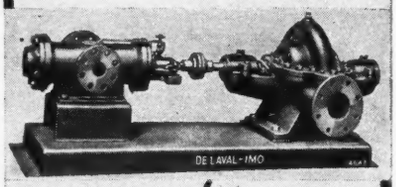
Petroleum Coordinator Harold L Ickes, Deputy Coordinator Ralph K Davies, and Defense Transportation Director Joseph B Eastman will be among the speakers at the Twenty-third Annual Meeting of the American Petroleum Institute to be held at the Palmer House, Chicago, November 9 to 12, according to William R Boyd. Jr. Institute president.

"This will be in all respects a war convention of the petroleum industry," Mr Boyd said. "The industry will hear and discuss, both in the general sessions and in the technical group sessions, just what the government has been doing and what it intends to do that affects the oil business. The war-time difficulties of the industry—the disruptions of normal transportation. the far-reaching cost and supply problems brought about by the impact of the war, the lack of necessary materials, and above all the accelerating demands for war products from petroleum — bring technological problems that make it more important than ever to assemble the oil industry's workers for analysis of common difficulties."

Mr Boyd, reporting as president of the Institute and as chairman of the Petroleum Industry War Council, and Mr Ickes, will address the first general session of the meeting on November 11. Mr Davies and his assistants and divisional directors will speak at a session on November 12, and Mr Eastman and other prominent government officials concerned with oil-industry problems will be heard at a special session on the evening of November 11.

Nine group sessions have been scheduled for the meeting, to discuss the protection of petroleum facilities, war-time automotive transportation, pipe-line transportation, synthetic rubber raw materials from petroleum and the refinery conversion program, hydrocarbon properties and research, and

NO SPEED LIMIT



IMO I MOVE OIL

for IMO

The DE LAVAL-IMO rotary displacement OIL PUMP operates at standard motor or turbine speeds. The pump here shown is driven by a high-speed water turbine. The three moving parts of an IMO pump are in perfect rotational balance. There are no valves and no gears and there is only one stuffing box, which is subject to suction pressure only. Any kind of oil is pumped in any volume and against any pressure.

Ask for Publication 1-98.

IMO PUMP DIVISION
of the De Laval Steam Turbine Company
Trenton, New Jersey

Better Than

LITHARGE and GLYCERINE for AMMONIA LINES—

- X-Pando Pipe Joint Compound is perfect for use in ammonia lines, brine lines, freon lines and other lines where litharge and glycerine are now used.
- X-Pando makes a joint which is easy to take apart. Yet when X-Pando sets, it ends leaks permanently.
- X-Pando is less expensive than compounds of litharge and glycerine and goes from 4 to 6 times further than other compounds. X-Pando is ready for

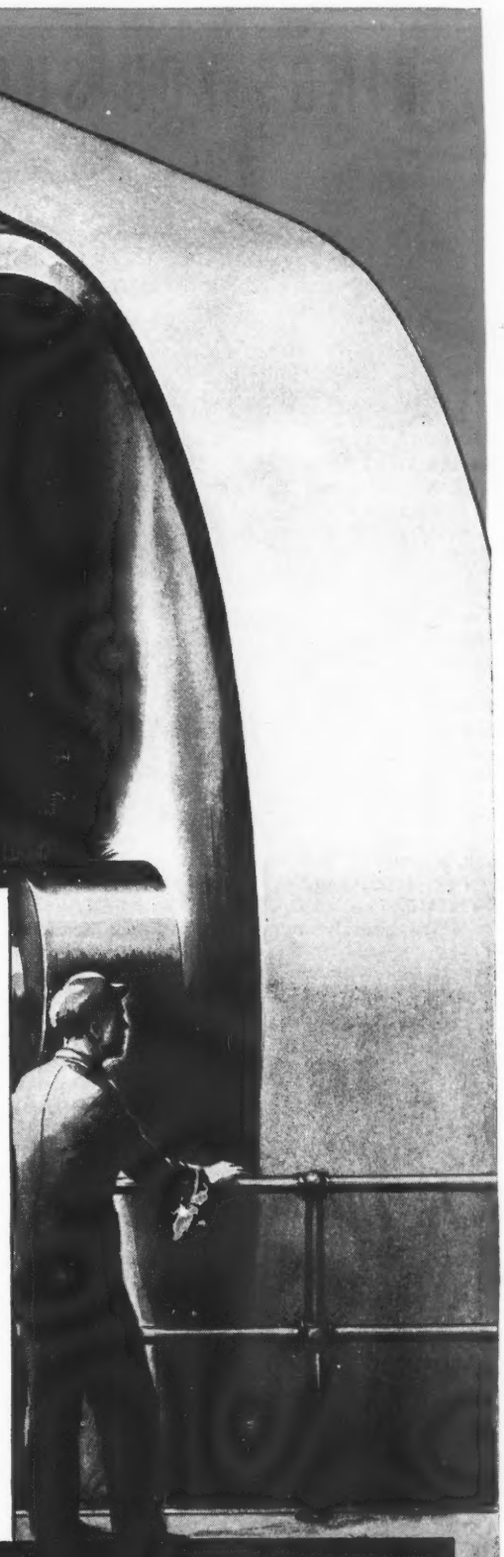
Immediate Delivery

X-PANDO PIPE JOINT COMPOUND

Expands as it sets, one formula for all uses; holds anything carried in metal pipe; withstands high pressure, deflection, high temperature, vibration. Get X-Pando from your local Mill Supply House.

X-PANDO CORPORATION
43-15-36th Street, Long Island City, N. Y.
Stillwell 4-7180
Canadian Distributors: La Salle Products Ltd., 159 Jean Talon St., Montreal, Quebec, Canada

IT'S GOOD BUSINESS TO DO BUSINESS WITH THERMOID



COMPLETE LINE—Power plant men find the Thermoid line of rubber and friction products most complete. From one *preferred,* dependable source they can get for their equipment every type of Transmission Belting, V-Belts and Drives, Conveyor Belting, Packings and wrapped and molded Hose of every type—air, steam, water, etc.

PERSONALIZED ATTENTION—An advisory engineering service is provided by Thermoid through its own trained field staff, augmented by alert, informed distributors. The personalized attention of Thermoid distributors and Thermoid representatives has resulted in lowered operating costs, higher efficiency for users of Thermoid Products.

CONSERVATION AID—To give practical help in conserving rubber products now in use, Thermoid offers a series of bulletins containing specific suggestions on installation and maintenance practices. These bulletins are free—write today for a complete set.

Thermoid
INDUSTRIAL RUBBER PRODUCTS
BUILT FOR THE JOB
QUALITY VALUE SERVICE

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THINGS YOU SHOULD KNOW

if you use pumps!

Things that make a big difference in performance between ROPER "hydraulically balanced" PUMPS and other pumps.

GEARS THAT FLOAT IN OPERATION SAVE YOU TIME AND MONEY! The pumping gears in ROPER "hydraulically balanced" PUMPS have hollow shafts so that internal pressure is equalized at all points. These gears are entirely separate from the drive shaft and are connected only by a sliding joint which permits them to actually "float" in operation. This sliding joint plus a special collar on shaft absorbs any shock or end thrust.

This feature means big savings in time and money for you because "hydraulically balanced" pumps are more efficient, last longer and permit periodic inspection of internal parts without disturbing piping or power unit.

REPLACEABLE BEARINGS GIVE PUMPS LONGER LIFE —The 4 large bearings (two on each side) in ROPER "hydraulically balanced" PUMPS are designed and constructed to withstand severe operating abuses and adequately handle peak loads. These flanged high lead bronze bearings also act as wearplates to protect face and backplate from wear. Can be replaced easily and inexpensively.

ROPER MECHANICAL SEAL REDUCES POWER REQUIREMENTS — Each ROPER "hydraulically balanced" PUMP is regularly equipped with a Roper Mechanical Seal. It saves money by reducing power consumption and keeps leakage to a minmum. Especially desirable where re-packing is not practical — that also saves you time and money.

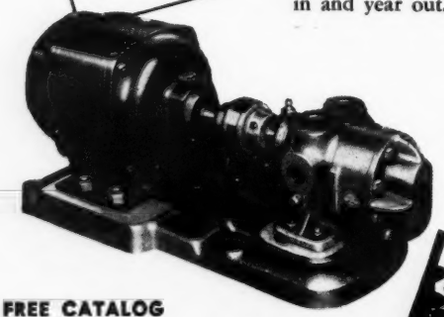
HYDRAULICALLY BALANCED

THIS SEAL appears on every ROPER "hydraulically balanced" PUMP. It means higher efficiency, quieter operation, greater dependability and longer life.

SAVES FLOOR SPACE—ROPER PUMPS are designed to operate at direct motor speeds, thus eliminating gears, belts, etc. . . . saves space, and what plant doesn't need more space?

ALWAYS PRIMED — Once primed and in operation a Roper will always pick up its own prime — ready for instant action.

AS DEPENDABLE AS OLD FAITHFUL — That is the reputation earned by dependable performance year in and year out.



FREE CATALOG

Send for your free copy of Catalog 944. It contains complete information on 16 different sizes of Roper Pumps. Learn how you can save money and trouble on your pumping problems.

★

THIS HAPPENED FROM COAST TO COAST

United Air Lines say this about Roper Pumps on their refueling tank trucks . . . "first, they are SPEEDY and DEPENDABLE . . . second, their QUIET operation makes them ideal for refueling sleeper planes . . . third, they are the most EFFICIENT we have ever used . . ."

★

THIS HAPPENED IN ILLINOIS

A manufacturing plant was using five pumping outfits . . . average life of each pump, 16 hours and cost per pump, $16.65. Roper analyzed the problem and made recommendations. RESULT — average life of pump was s-t-r-e-t-c-h-e-d to 13 months. Net saving to customer in 13 months — $29,690.00.

★

THIS HAPPENED IN OHIO

Weaver-Wall Co., Cleveland, use Roper Pumps for pumping hot asphalt at temperatures up to 400° eight hours per day in the winter, twenty-four in the summer. Some test! But Roper Rotary Pumps endured for more than 12 years.

ROPER *Rotary* PUMPS

GEO. D. ROPER CORP. ★ ★ ★ ROCKFORD, ILLINOIS

government problems in controlling drilling and production. Only about 40 committee meetings, whose work is contributing directly to the war effort, are planned. The usual Annual Dinner will not be held.

Why Rationing?

America's rationing program—what it is, why the Government is forced to ration goods, what makes certain commodities scarce, how things are rationed—is the subject of a pamphlet released by the Office of Price Administration.

The pamphlet is a simple explanation to the public of the important role played by rationing in the wartime life of this nation. Rationing, which has been established in each of the belligerent countries since 1939, is "a community plan for dividing fairly the supplies we have among all who need them" according to OPA.

"It is an American idea," OPA points out, "to share when supplies are scarce—to sacrifice, if necessary, but sacrifice together, when the country's welfare demands it."

Among the reasons given for the scarcity of goods are enemy conquest of sources of supply; conversion of materials, labor and machinery to production for war, and transportation shortages due to submarine sinkings and heavy war shipments.

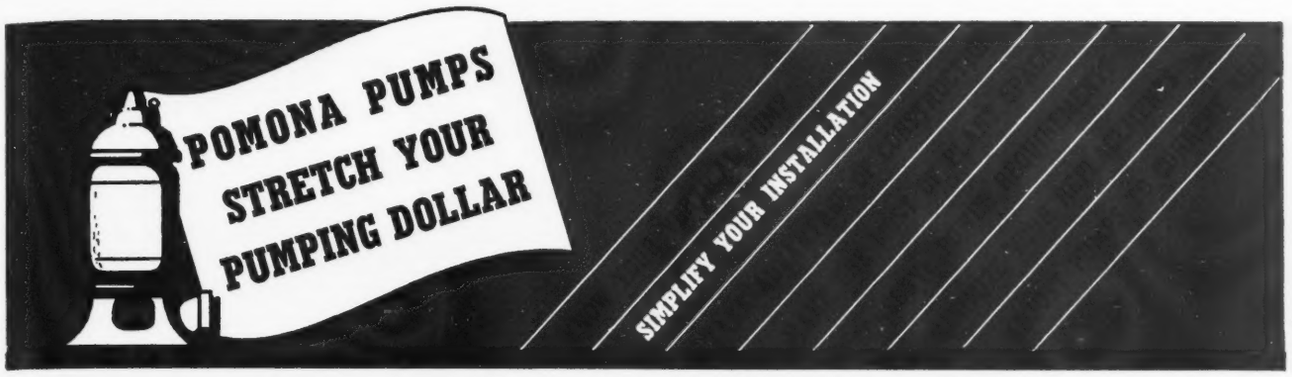
Then follows a summary of the types of rationing set up in this country. "When the supply is large enough to distribute some to all, everybody gets a share; those with special needs may get more," the pamphlet points out. "When the supply is not large enough to distribute some to all, the commodity goes only to those who need it in connection with service to the war effort or the public welfare."

Each of the commodities rationed since the war began is taken up in detail—tires, automobiles, sugar, gasoline, bicycles and typewriters.

"Rationing, Why and How," is a revised and illustrated edition of a former OPA publication. Copies may be obtained from all Regional and State offices of OPA.

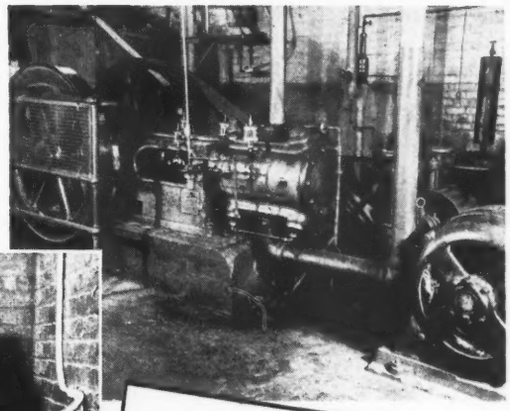
Scarce Maintenance and Repair Materials

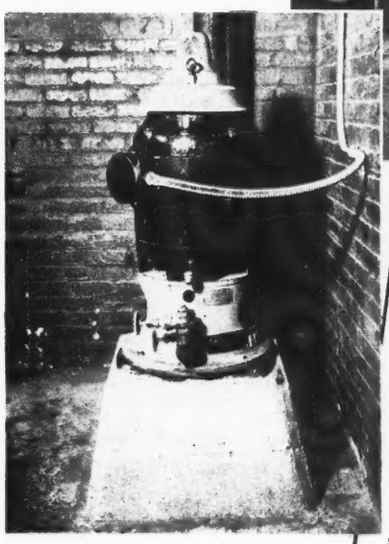
The amount of scarce metals that public utilities may use for maintenance and repair of transmission and distribution systems during the last quarter of 1942 is cut approximately 40 percent under Order P-46 as amended Oct. 10. A reduction of the same percentage has



Are YOU taking full advantage of the many savings possible in your Pomona installation?

RIGHT NOW, simplicity is a doubly important factor in pump design. And in your Pomonas you have a pump in which not only *construction* has been simplified to the "Nth" degree, but also *installation.* Priming pumps and similar accessory equipment are entirely unnecessary, complicated hook-ups are eliminated, extra valves and fittings are saved, and installation costs are cut to the bone. Best of all, you get a clean, compact, easy-to-maintain installation that — *in addition to reducing installation costs* — saves plant space, increases accessibility of equipment, and conserves operator's time every day the unit is in service!





But it may be that in your particular Pomona installation full advantage has not been taken of Pomona's installation simplicity. Maybe you hooked your Pomona into the piping layout of your former pump without removing the unnecessary fittings. Valves, nipples, and other fittings are particularly valuable now. So re-check your Pomona installation. Are there extra fittings that can be salvaged for other work? Could you relocate your discharge to better advantage? You know, Pomonas — *unlike horizontals* — can have their discharge lines at, above, *or below,* floor level — whichever is most convenient for YOUR requirements. *Make sure you have taken full benefit of this feature!*

▸ And in re-locating your Pomonas, keep this in mind. Because of their compact vertical design and balanced rotational loads, Pomonas eliminate need for costly, bulky foundations. A simple base pad — or even two timbers anchored across a sump top — is all the support a Pomona needs!

▸ Also remember—*Pomona Pumps need no priming,* for the pump impellers are submerged. So there may be a priming pump or other accessory item needed for your former pump that's still in your present piping hook-up. You don't need it for your Pomona, so why not salvage it and put it to good use?

▸ Then check this point—Because there are no exposed working parts, no dangerous rotating shafts, belts, or wheels to endanger workmen, your Pomona needs no safety guards around it. You can remove that elaborate "bird cage" left over from your previous pump—salvage the pipe and screen, *and also gain additional usable floor space!*

Your Pomona distributor will gladly go over your particular installation with you and suggest how you can take fullest advantage of Pomona's simple installation requirements. Why not call him today?

IMAGINE THE SAVINGS A POMONA MADE HERE!

Here's a typical example of a Pomona owner who took full advantage of Pomona's simple installation requirements. It's hard to believe the two illustrations above are the same pumping job, before and after a Pomona took over. But they are. Notice in the old installation the maze of piping, valves, fittings, the whirling fly wheel, open belts that made this pump expensive to install, costly to service, space-wasting to keep.

Now notice how, in replacing this blunderbuss with a Pomona, the operator wisely located his Pomona in an out-of-the-way corner, leaving the central floor space occupied by the former pump completely open for new equipment. Also notice the simple discharge line close to the wall . . . and small base pad upon which the pump sets.

And you Pomona owners, knowing first-hand the remarkable performance Pomonas give, won't be surprised to learn that this Pomona Pump lifts 25% more water, 12% higher — at a direct 75% power saving (12½ h.p. on Pomona vs. 50 h.p. on former unit). That's simplified installation PLUS!

POMONA
Water-Lubricated
PUMPS

POMONA PUMP CO., 120 Broadway, New York City
Plants located at 4301 South Spring Avenue, St. Louis, Missouri, and 206 Commercial Street, Pomona, California

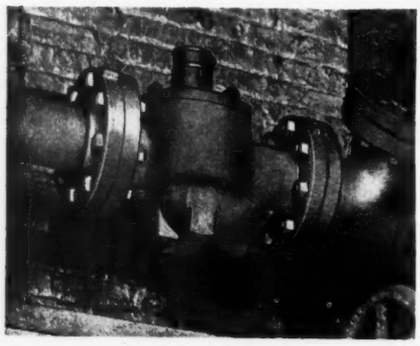
"Stretching Your Pumping Dollar"— a helpful manual on pump application and operation — has been compiled for all pump users, and is yours for the asking. *Write for it!*

PROPERLY DESIGNED . . . ENGINEERED . . . MANUFACTURED

Seco COAL SCALES

STOCK Cleanline Coal Scales, in 5 to 20 ton capacities, are built up to a quality standard, in keeping with your boiler feeding demands. For "on-the-job" service . . . every day of the year, year in, year out, choose SECO equipment. STOCK Engineering Co. supplies complete "BUNKER-TO-STOKER and BUNKER-TO-PULVERISER" coal feeding installations. Drawings will be prepared without charge showing SECO equipment as it fits into your plant.

STOCK ENGINEERING CO. 9805 THEODORE AVE. CLEVELAND, OHIO



HENSZEY BOILER FEED WATER METERS

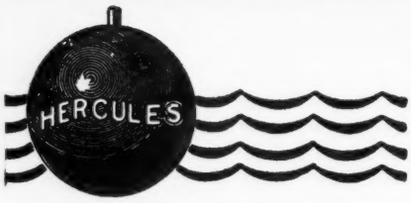
Henszey Meters accurately measure boiler feed water, hot dirty blowdown, condensate, free running chemicals, and many other liquids that cannot be satisfactorily measured by ordinary meters. They are equally accurate at high or low flow, high or low pressure, on reciprocating, duplex, triplex or centrifugal pumps. Sizes range from 10 g.p.m. to 1200 g.p.m. cold water steady flow rating. Pipe connections ¾" to 6". Calibrations can be made to read in gallons, pounds, or cubic feet at any specified temperature. The meter is easily installed right in the line.

Check your meter requirements today. Send for complete information stating your specific problem if possible. No obligation for unbiased recommendations.

HENSZEY COMPANY
Dept. D11, Watertown, Wis.

HENSZEY

HERCULES
Seamless Copper
FLOATS



GUARANTEED TO STAND UP!

Every Hercules Float carries our guarantee to stand up under 350 lbs. working pressure and 500 degrees temperature.

Fabricated of seamless copper under our special spinning process. Hercules Floats are uniform in thickness and high in mechanical strength.

You can depend on Hercules for floats—in standard shapes up to 10 in. and in special types to your specifications—to give long, dependable, economical service.

Insure care-free maintenance of water level in your heaters, tanks, reservoirs and other equipment by specifying "HERCULES."

HERCULES FLOAT WORKS
200 Franklin St.
SPRINGFIELD, MASS.

also been made in permissible inventories.

The amendment brings the WPB Power Branch's control of materials usage by utilities in line with program determinations recently recommended by the WPB Requirements Committee.

Previously a utility could use as much scarce metal for maintenance, repair and for small construction jobs as it used during a corresponding quarter in 1940. Under the amended order this amount is cut to a percentage of the base period, the reduction amounting to approximately 40 percent.

The metals affected are chiefly copper and steel, and the cut is possible largely because all non-essential utility maintenance and construction has been halted.

The amended order also requires, for the first time, that electric utilities make at least 75 percent of their wire, cable and bus bar purchases from the inventories of other utilities instead of from manufacturers. Gas and water utilities must get at least 40 percent of their pipe and other similar supplies from the inventories of other gas and water utilities.

All ratings assigned by the order for materials required for maintenance and repair have been raised from A-2 to AA5, with a rating of AA-2 for emergency repairs.

The amended order contains a specific definition of what is meant by the inventory of a utility, making it clear that it does not include material which a utility obtained under a project rating for the construction of a specific war project (such as a new transmission line). Of course, any material left after the completion of the war projects goes into the inventory of the utility and becomes subject to control.

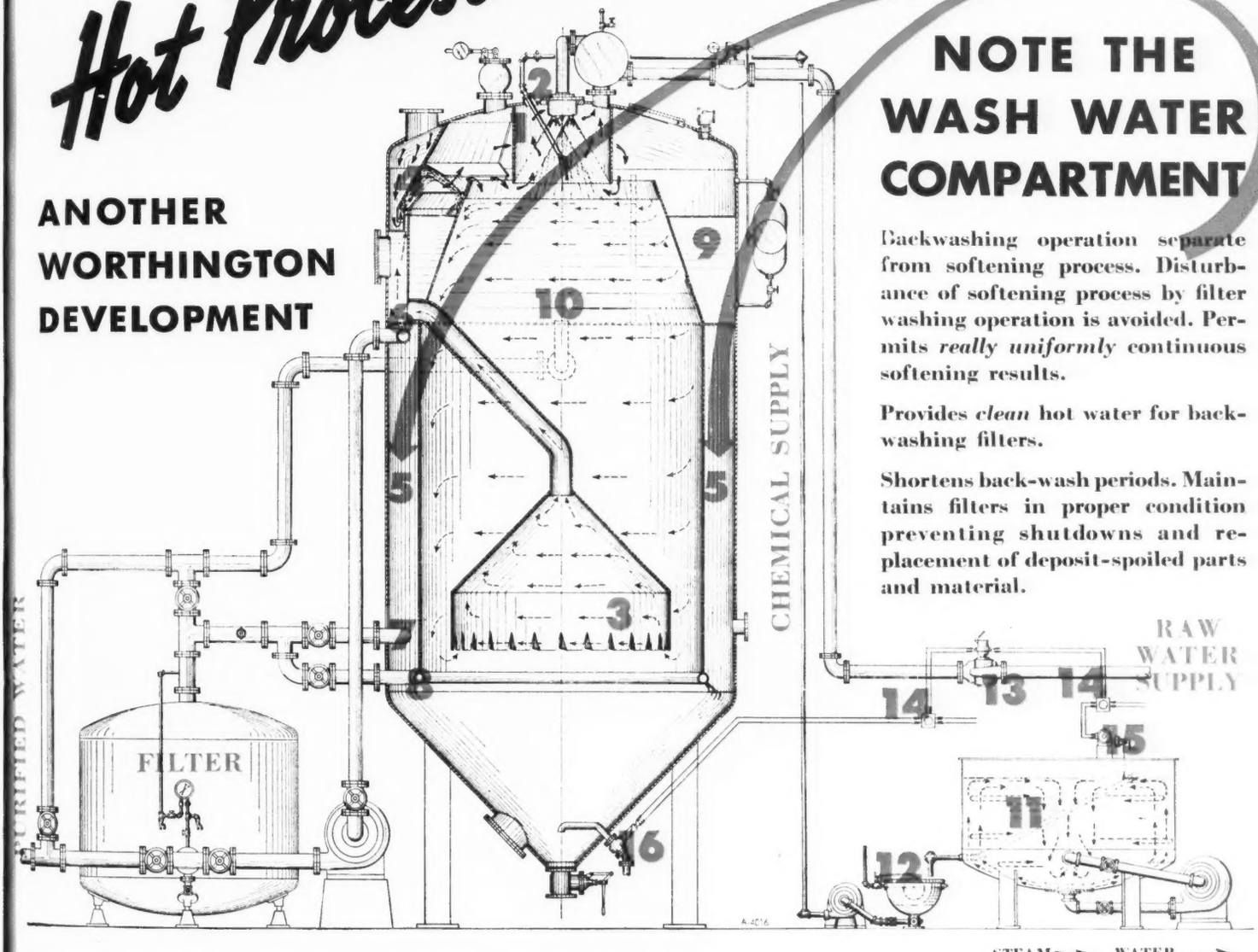
The amended order also makes it clear, in line with the recent assignment to the Bureau of Governmental Requirements of WPB of all public sanitation utilities, that although such utilization will remain under P-46 until the Bureau of Governmental Requirements gets out its own order, they are to send all communications and applications to the Bureau instead of to the Power Branch.

Previously there was confusion as to whether the Power Branch or the Bureau of Governmental Requirements handled water and public sanitation utilities. It was decided recently that the Power Branch would handle water problems and the Bureau of Governmental Requirements would handle public sanitation utilities.

Supplementary Orders P-46-a and P-46-b have been reissued, without changing their meaning, to accord with the revised wording of the basic order.

The only uniformly continuous Hot Process Water Softener!

ANOTHER WORTHINGTON DEVELOPMENT



NOTE THE WASH WATER COMPARTMENT

Backwashing operation separate from softening process. Disturbance of softening process by filter washing operation is avoided. Permits *really uniformly* continuous softening results.

Provides *clean* hot water for backwashing filters.

Shortens back-wash periods. Maintains filters in proper condition preventing shutdowns and replacement of deposit-spoiled parts and material.

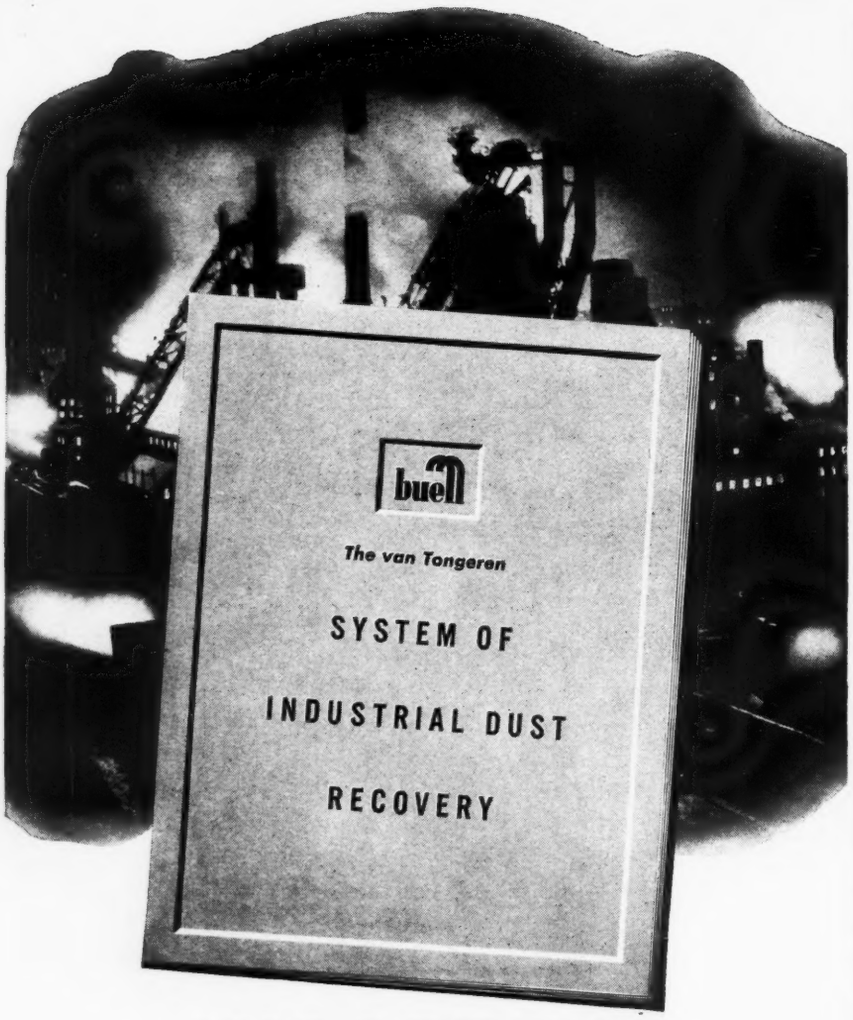
And check these numerous other features

1. Primary Heater. Non-scaling. Efficiently heats the raw water and provides rotary mixing of water and chemicals.
2. Chemical Applicator. Removable. Sprays chemical through steam. Facilitates mixing and reaction.
3. Up-take Cone. Baffled serrations assure even draught. Increases softener capacity 50% over common practice.
4. Deaerating Heater. Simple. Effective. Self adjusting. No moving parts.
5. Wash Water Compartment. (See above).
6. Supply to Filter Wash Pump Suction.
7. Discharge of Dirt Laden Wash Water. Reclaimed by settling clear within 1½ hours.
8. Cleansing Ring. Provides uniform distribution of jets for washing softener precipitate and wash water sediment to central area of conical bottom.
9. Storage for Treated and Deaerated Water.
10. Treated and Deaerated Water Outlet to filters or direct to boiler feed pumps.
11. Chemical Agitator. Maintains chemical mixture of uniform strength. No submerged bearings or paddles. No objectionable surface wave action to interfere with decantation.
12. Chemical Dilution and Pump Suction Tank.
13. Proportioning Meter. Accurate. Low loss. Equipped with totalizing register.
14. Relays. Adjustable time interval.
15. Decanting Mechanism. Sturdy. Reliable. Accurate.
16. Sludge Remover. Removes sludge in proportion to its rate of formation.

For full details Bulletin W-212-B2 is available at district offices (in all principal cities) or at headquarters.

WORTHINGTON

WORTHINGTON PUMP & MACHINERY CORPORATION • GENERAL OFFICES: HARRISON, N. J.



IMPORTANT

TO WAR PRODUCTION PLANTS

This New, Informative, 28-Page Book

Efficient dust recovery is important to every branch of war production...aviation, chemicals, dehydrated foods, machining, metal working, processing, rock products, and many others. All these can use Buell Dust Recovery Systems to save material, increase production, and insure quality.

The wide use of Buell Dust Recovery Systems by so many of America's great industrial concerns is their best advertisement. A representative list of Buell users shows *more than half with two or more installations!*

The new book shown above explains Buell's seven *plus* advantages, of particular interest to war plants. Send for your copy today. *Ask for Bulletin P-11.*

BUELL ENGINEERING COMPANY, Inc.
10 Cedar Street, New York
Sales Representatives in Principal Cities

CONSULT BUELL *First* IN DUST RECOVERY
for Chemical • Rock Product • Metallic • Food • Flue or any other dusts

buell
DUST RECOVERY SYSTEMS

Copper for Distribution Cutouts Conserved

Acting upon a request from WPB to save critical materials, the National Electrical Manufacturers Association has changed the NEMA Standard for Distribution Cutouts to reduce the over-all length of universal fuse links (0 to 15 kv) for distribution cutouts from 23 to 20 inches (minimum). This change in the standard was approved September 9, 1942 and became effective immediately thereafter for the duration of the emergency. It applies to links manufactured after that date.

Links manufactured prior to that date to the former standard of 23 inches and which are now in stock will not be affected. Since practically all applications of these 23-inch links, as well as many of the new 20-inch ones, will permit cutting off surplus copper ends when they are installed in distribution cutouts in service, every effort should be made by users to accumulate these ends for salvage.

This ruling, together with the reduction in length of the new links, should effect savings of several tons of copper annually.

Proposed Wire Rope Standard Issued

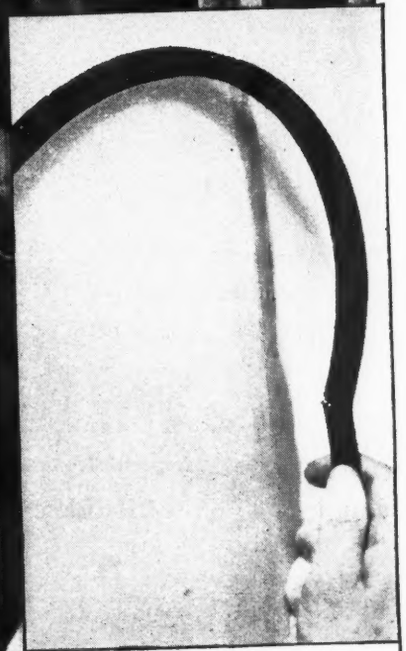
A proposed Simplified Practice Recommendation for Wire Rope has just been submitted to producers, distributors, users, and others interested for approval or comment, according to an announcement by the Division of Simplified Practice, National Bureau of Standards.

This recommendation, which includes sizes, constructions, grades and breaking strengths of the vast majority of tonnage of wire rope, is based on an exhaustive analytical review of existing published standards of the industry. The recommendation is designed to conserve strategic materials and available productive capacity for the war program and at the same time adequately care for the more important consumer requirements.

The proposed recommendation was developed by the Contact Committee of the Wire Rope and Strand Manufacturers Association and submitted for passage through the regular procedure of the Division of Simplified Practice, National Bureau of Standards, at the request of the Wire and Wire Products Section, Iron and Steel Branch of the War Production Board.

War on *Wear!*

MANHATTAN'S Suggestions for the Care of V-BELTS



V-Belt destroyed by insufficient tension. High slip created excessive heat which wore and cracked cover.

Rubber has so many essential applications in the war production program that scarcity must be overcome by conservation in every way possible.

Making V-Belts last longer is more than common sense; it is a patriotic contribution to the "winning-power" of the country. Follow these important suggestions:—

1. Do not allow oil, grease or gasoline to come in contact with belt.
2. Avoid exposing belts to sunlight and excessively hot or cold weather.
3. Provide take-up facilities.
4. Don't leave tools or other objects near belt to get caught in drive.
5. Avoid abrasion on nearby objects.
6. Do not force belts onto sheave with instruments of any kind. Slack off on take-up and place belts into grooves.
7. Work belts around grooves until all of the slack is on ONE SIDE OF THE DRIVE, then tighten take-up until belts are fairly snug.
8. Before starting check pulley alignment, check bearings for oil and see that drive is clear and free. Adjust take-up so that when drive is operating at full load and full speed, only a slight bow appears on slack side. Vertical drives, extremely short center drives, and drives carrying pulsating loads must be operated tighter than others.
9. Use sufficient number of correct sized belts to handle maximum load. Be sure sheaves are over accepted minimum diameters.
10. Design new drive to take standard belt and sheave sizes.
11. Belts must not bottom in grooves. Bottoming causes belt-destroying heat from slip.
12. Do not use belt dressing. If belts slip, clean with cloth dampened in gasoline and tighten drive slightly.
13. See that sheave grooves are free from burs and extreme wear. Replace worn sheaves and check alignment periodically.
14. On failure of first belt on a drive, replace entire set with new belts, keeping worn belts as spares for subsequent failures.
15. Store belts uncoiled and hung over forms on rack or wall in a cool, dark place.
16. Consult your MANHATTAN service man. Write factory or your distributor.

You can get reprints of these suggestions for maintenance men from MANHATTAN field representatives or distributors or by writing direct. This is No. 3 of a series on rubber conservation. Wall cards on care of belts and hose are also available.

KEEP AHEAD WITH MANHATTAN

Conserve your rubber equipment; salvage worn out rubber and buy WAR BONDS—three steps to Victory.

THE MANHATTAN RUBBER MANUFACTURING DIVISION
of RAYBESTOS-MANHATTAN, INC.
EXECUTIVE OFFICES PASSAIC, NEW JERSEY

Save CRITICAL METALS

Switch to POWELL Iron Body Valves wherever possible

Fig. 190

Iron Body, Bronze Mounted "Irenew" Globe Valve for 150 pounds W.S.P. Has screwed ends, Union bonnet and regrindable, renewable hard bronze seat and disc. Available in sizes from ¼" to 3", inclusive.

Not so long ago many buyers and users of valves automatically thought of bronze. It was accepted as the standard for many installations . . . apparently the impression existed that the desired service could not be obtained if any other metal were used.

But—that was before Pearl Harbor!

Today, with copper and tin high up on the critical metals list, the use of the more available metal becomes urgent. Research and recent experience have proven that iron valves—especially properly designed and sturdily built POWELL Iron Valves—will, in many instances, serve just as effectively as bronze valves.

Therefore, when you specify POWELL Iron Valves you not only render a patriotic service by helping to conserve the now critical copper and tin, but you can expect quicker delivery because of the lower priority rating required. And—you'll have EXTRA SAVINGS TO INVEST IN WAR BONDS.

The Wm. Powell Co.

Dependable Valves Since 1846

CINCINNATI, OHIO

POWELL

by using IRON BODY VALVES

Below—Iron Body, Bronze Mounted, Standard "Model Star" O. S. & Y. Globe Valve, with flanged ends, outside screw rising stem, bolted flanged yoke and regrindable, renewable bronze seat and disc. Made in sizes from 2" to 12", inclusive, for 125 pounds W.S.P.

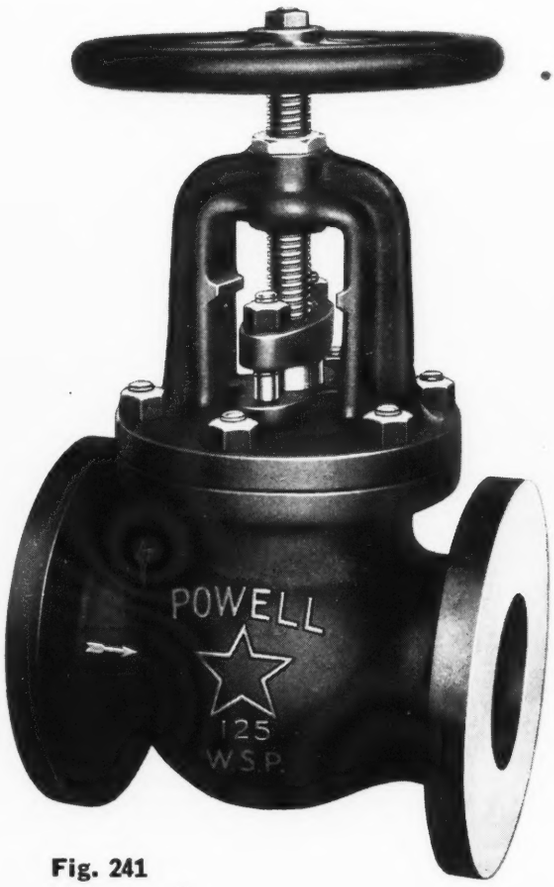


Fig. 241

Fig. 256

Above—Iron Body, Bronze Mounted, Extra Heavy "Model Star" O. S. & Y. Globe Valve for 250 pounds W.S.P. Has flanged ends, outside screw rising stem, bolted flanged yoke and regrindable, renewable bronze seat and disc. Made in sizes from 2" to 12" inclusive.

VALVES

COTTRELL PROCESS

of

ELECTRICAL PRECIPITATION

universally recognized as a
standard method of removing

DUST, FLY ASH, FUME, MIST & FOG

***from* GASES**

30 years of research development and operating experience throughout the world is incorporated in the

COTTRELL INSTALLATIONS

offered to meet the requirements
of any problem by

RESEARCH CORPORATION

405 LEXINGTON AVENUE
NEW YORK CITY

59 EAST VAN BUREN STREET
CHICAGO, ILL.

Oh, the North Countree is a hard countree,
And it's tough on Diesel oil—
But hark while we chant of a cold storage plant
(Where you keep things, lest they spoil).

Back in April, 'Forty—yes, 1940—
A big six-cylinder Dies'
Went to work with a will, creating a chill—
Its motto: "I aim to freeze."

Oh, the North Countree is a hard countree,
And a year is twelve months long;
Yet, it's perfectly true that in March,'42,
This Diesel still ran like a song!

Oh, oil-buyers wary, oh oil-buyers chary,
You can see that the moral is clear:
Your Diesel runs swell-o on RPM DELO
And does so for many a year!

EVER since the Marshfield Cold Storage Company of Marshfield, Wisconsin, installed its International UD-18 6-cylinder, 108-H.P. Diesel in April, 1940, the engine has been lubricated exclusively with RPM DELO. It has had 10,000 hours of continuous operation—and here are the results:

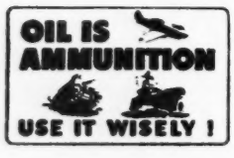
When the engine was thoroughly overhauled last March, cylinders showed less than .0035 inch maximum wear, pins were all tight and showed less than .002 inch wear, rod bearings were in "exceptionally fine condition." No wonder the company says, "we are indeed happy we selected RPM DELO as our lubricant and would not hesitate to highly recommend it."

STANDARD OIL COMPANY OF CALIFORNIA

RPM DELO

RPM DELO is marketed under the following names:
RPM DELO · Caltex RPM DELO · Kyso RPM DELO
Signal RPM DELO · Imperial-RPM DELO · Sohio RPM DELO
CONCENTRATE
Ask your Diesel engine manufacturer or distributor for the RPM DELO supplier in your vicinity

bearings gobbled



grease like

...hungry wolves

until this plant switched to Tycol Green Cast Greases

Lubricating a soap-cooling machine consisting of two large steam heated drums and two water-cooled rolls was a continuous problem to this plant. Steam passing through the roll hubs at 300° F. made bearings so hot that grease quickly thinned down and dripped away. Even though grease boxes were filled every day, bearings were constantly burning out. Then a Tide Water engineer recommended switching to Tycol Green Cast Grease. Since making the change this plant has ended former lubrication worries, and cut down extravagant grease consumption.

"Our practice now," says the plant superintendent, "is to put about five pounds of grease into each box and almost forget about them for two weeks or longer. Tycol is undoubtedly the right grease for the job. It stands the high temperatures and does a thorough job of lubricating. The amount of grease we save, the repair bills we avoid, and the hours of labor we do away with make this decidedly an example of how waste can be eliminated by using the correct grease." Tycol Green Cast Greases are made with fine quality cylinder oils and a minimum of soap. More cylinder oil – less soap means better lubrication under all operating conditions.

Let a Tide Water engineer show you how to step up production through efficient lubrication. Write the Tide Water Associated Oil Company, 17 Battery Place, New York, N. Y.

DRUMS! DRUMS! DRUMS! DRUMS!
War needs make it extremely important that all empty drums be returned immediately.

INDUSTRIAL TYCOL OILS-GREASES

TIDE WATER ASSOCIATED OIL COMPANY
EASTERN DIVISION: 17 BATTERY PLACE, NEW YORK
Principal Branch Offices: Boston, Philadelphia, Pittsburgh, Charlotte, N. C.

MAKERS OF THE FAMOUS VEEDOL MOTOR OIL

"Lady, you've got a war job!

"WHEN our fighting men need every ounce of steel we can give them, there isn't as much steel as usual for replacing worn elevator ropes. If you're running a car switch elevator where the smoothness of starting and stopping is controlled by you, *you* can make a direct contribution to the war effort by running that car *right*. That's your war job.

Let's see what that "right" means with reference to elevator ropes. On the car you're running, there are six or eight wire ropes made up of 700 or more separate steel wires. Obviously, if put to undue strain by jolts from quick starting and stopping, a lot of those 700 wires won't last very long. The car you're running may use as much as 3 tons of wire rope! That's a lot of steel to divert from the manufacture of guns and tanks.

Running a car switch elevator is in many respects like driving a car. Today, the comparison is even more apt than before—for quick starts and stops wear out elevator ropes just as much as they wear out tires. And conserving steel in elevator use is important as conserving rubber on automobiles.

Here's what you can do to run your car right—and conserve steel for Victory; Run your car as *smoothly* as you can. That means simply this: start slowly, accelerate evenly, and stop smoothly *at floor level.*

Don't try to start your car at full speed, by pushing the control handle all the way over. Move the handle slowly and steadily from neutral to full-speed position. Doing this will give you even pick-up.

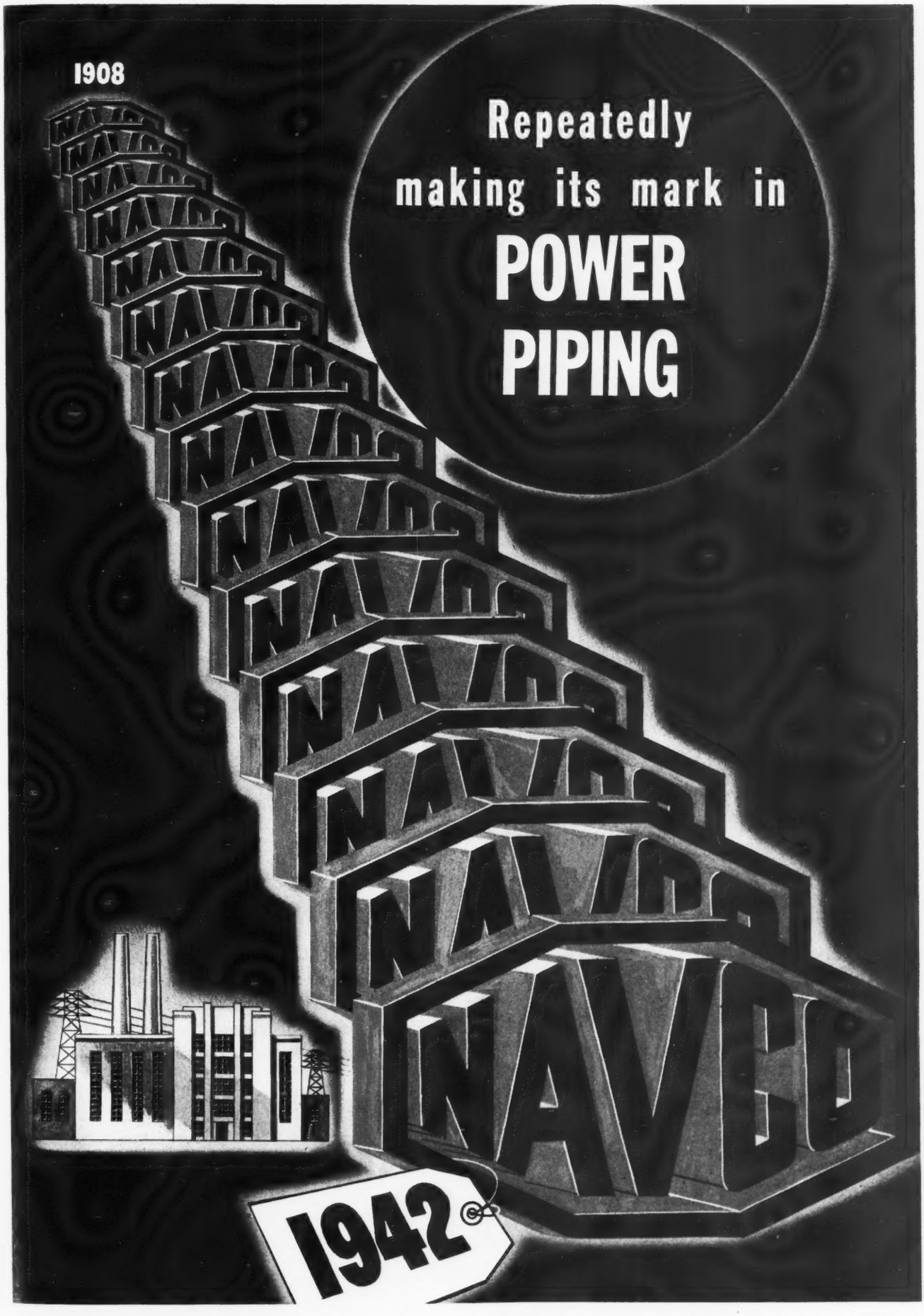
In stopping, *don't* just let go of the handle. As in starting, move it slowly and steadily from full speed to neutral. Avoid stopping in such a way that the car has to be "jockeyed" up or down to floor level.

If car speed is too high for you to stop consistently at floor level, inform the building engineer. A difference of a hundred feet a minute may be enough to enable you to hit the floor every time. You can lengthen the life of elevator ropes by limiting both the speed and the rate of starting and stopping in the same way you do with your tires. It is easier on you, *too!*"

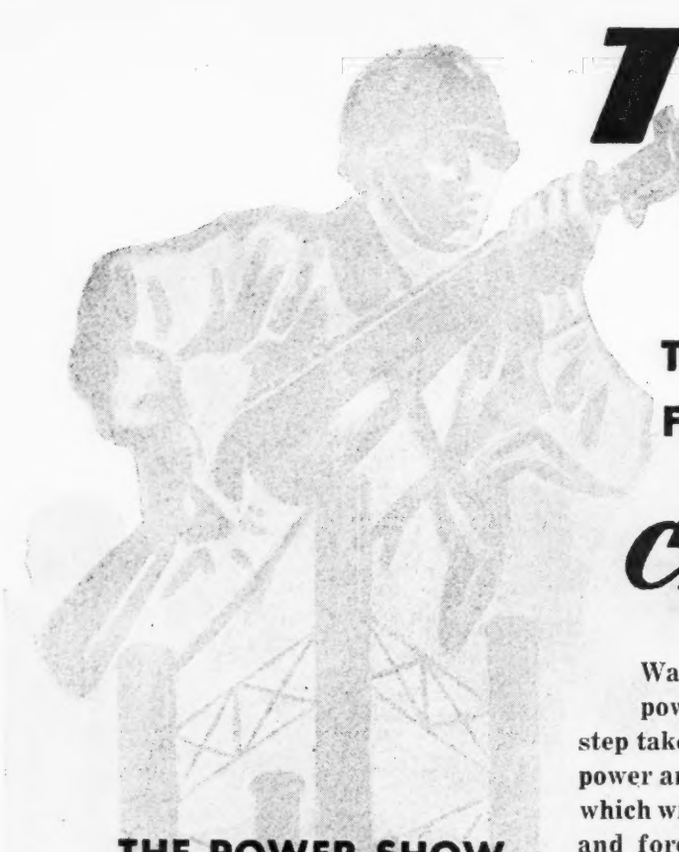
JOHN A. ROEBLING'S SONS COMPANY
TRENTON, NEW JERSEY
Branches and Warehouses in Principal Cities

★ PROMPT SERVICE
★ on essential orders
★ from warehouse
★ stocks or mill

ROEBLING
"Traction Steel" ELEVATOR ROPE



NATIONAL VALVE MANUFACTURING COMPANY • PITTSBURGH, PENNA.



TODAY

THE POWER ENGINEER FACES THE SUPREME *challenge..*

War places a grim, heavy responsibility on the power engineers of this Nation, for behind every step taken by our vast war industries is the need for power and more power. This constitutes a challenge which will test engineering ability, knowledge, vision and foresight. It makes attendance at this year's

POWER SHOW

even more vitally important than ever before. It becomes now, not only a privilege, but the duty of every engineer to attend this exposition, this year stripped of its peacetime frills and streamlined for war.

Engineers and executives with power interests will save valuable time in solving their power problems by studying the exhibits and observing the demonstrations at this all-important Power Show. Come to compare and learn about the latest and best methods, materials and instruments used for power generation, transmission and use. Come prepared to discuss your power problems with engineering specialists in attendance at exhibits to help you.

Whether your plant is directly or indirectly connected with our war effort, come to the Power Show and see for yourself engineering's newest short cuts to the generation and use of power for war and victory.

THE POWER SHOW WILL HELP YOU SOLVE YOUR WAR-TIME PRODUCTION AND MAINTENANCE PROBLEMS

•

This year moved to

MADISON SQUARE GARDEN

because the U.S. Army has taken the exhibition floors of Grand Central Palace

See how . . . hear how . . . learn how . . . at the

15th NATIONAL POWER SHOW

NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING

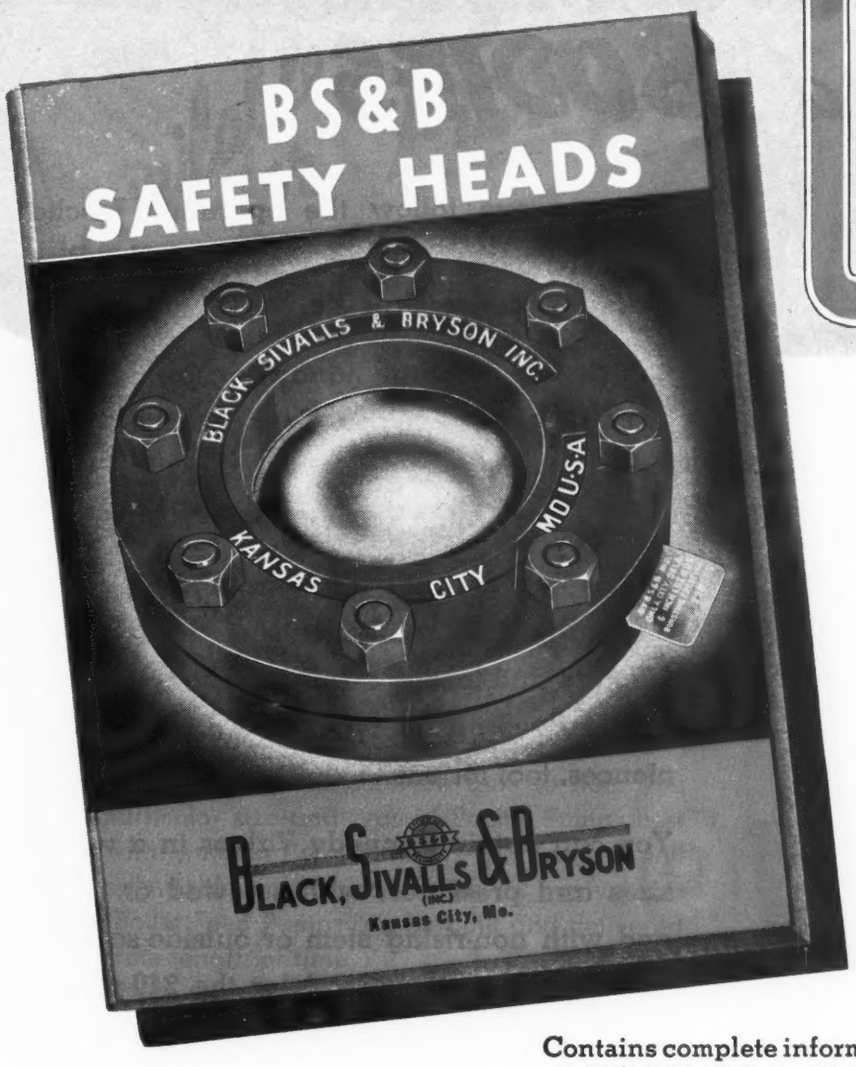
NOV. 30 – DEC. 4, 1942 – MADISON SQUARE GARDEN, N. Y.

Managed by International Exposition Co.

3065

It's Here!

The New B S & B SAFETY HEAD Catalog



Contains complete information of our various types of B S & B Safety Heads, Combination Safety Head and Relief Valve Units, Conservation Vent Valves, Pressure Vessels, Chemical Feeders!

Get Your Free Copy, in Booth 416, Madison Square Garden during Power Show, Nov. 30 to Dec. 4

OR WRITE TO...

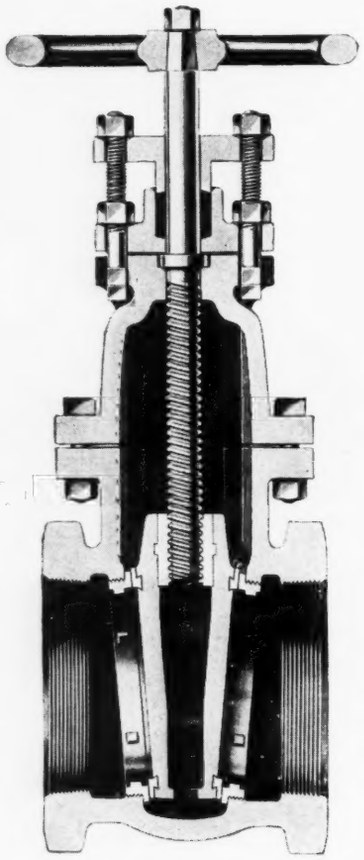
BLACK, SIVALLS & BRYSON (INC.)

EFFICIENCY BS&B RELIABILITY

7510 East 10th St. Kansas City, Mo.

STRONG EFFECTIVE DURABLE

OPERATING MECHANISMS and BODIES



Let your eye follow the operating mechanism of this Iron Body Kennedy Standard Non-Rising Stem Screwed Wedge Gate Valve.

First, notice the large handwheel for ample leverage. Then look at the heavy stem and the sturdy proportions of the wedge disc mechanism.

Notice, too, the thick sections of body and bonnet, the bronze bushings at all stem contact surfaces, and the many little refinements of design that provide strength and lasting security. The outside screw and yoke valves of this type have many special conveniences, too, for easier repacking and manipulation.

You can obtain Kennedy Valves in a wide range of sizes and pressures, with screwed or flanged ends and with non-rising stem or outside-screw-and-yoke. For full description, send for the 240-page Kennedy Catalog.

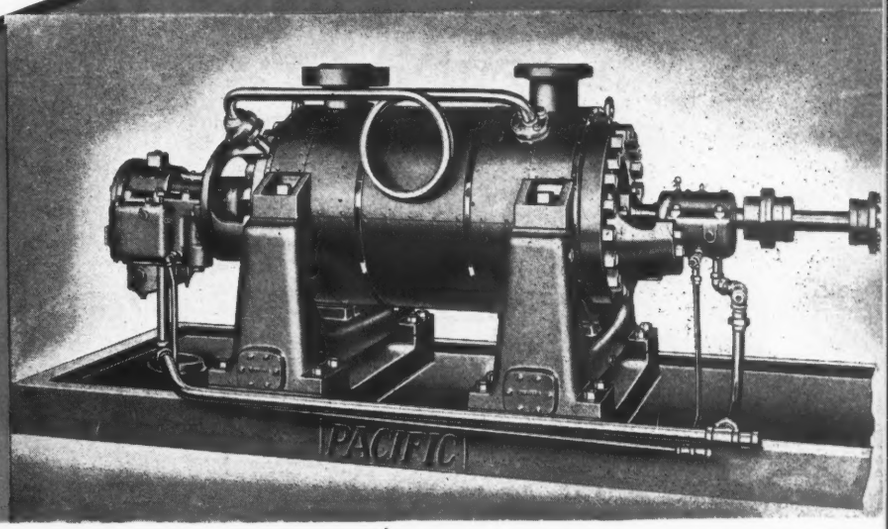
THE KENNEDY VALVE MFG. CO.
ELMIRA • NEW YORK

KENNEDY *valves... pipe fittings... fire hydrants*

PACIFIC PUMPS

available for Prompt Delivery

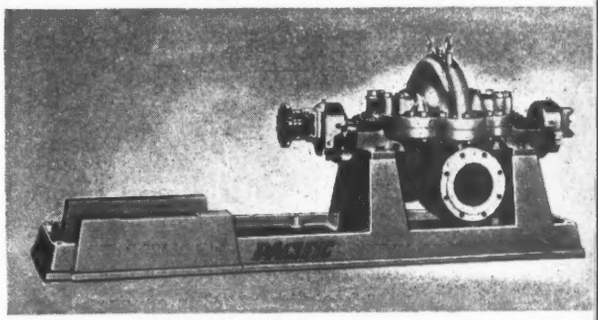
FOR AMERICA'S VITAL PUMPING SERVICES



PACIFIC Type I
Boiler Feed Pump installed by a leading Mid-West Utility.

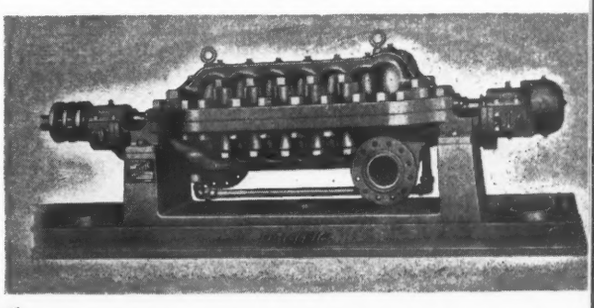
Today Pacific Pump Works engineers are able to help you determine the particular size and type of Pacific Pumps best suited for your vital pumping requirements--pumps that will give efficient, dependable, economical service for many years to come. Pacific Boiler Feed Pumps can be built and delivered within a reasonable length of time.

The advantages you gain are these: You get pumps, engineered and tested for limits far greater than they will meet in actual service, thus protecting you against the hazards of operating failure and possible shut-downs. You help conserve strategic war materials. You save time and energy because your pumping problems are solved successfully for years to come. Power plant engineers can tell you "If you want action--not apologies--call, write or wire PACIFIC."



PACIFIC Type KH—Single-Stage Horizontally Split-Shell Boiler Feed Pump installed by a major refinery.

"YOU CAN'T BUY A BETTER PUMP THAN PACIFIC"



PACIFIC Type JH—7-Stage Boiler Feed Pump installed by a large municipality.

PACIFIC PUMP WORKS

EXECUTIVE OFFICES AND PLANT: HUNTINGTON PARK, CALIFORNIA

EXPORT OFFICE: 30 ROCKEFELLER PLAZA, NEW YORK

SALES AND SERVICE OFFICES IN PRINCIPAL CITIES THROUGHOUT THE UNITED STATES

Affiliated Companies: Clark Bros. Co., Olean, N. Y.; Dresser Mfg. Co., Bradford, Pa.; The Bryant Heater Co., Cleveland, Ohio.

PACIFIC PUMP WORKS PACIFIC HUNTINGTON PARK CALIF

PACIFIC Boiler Feed PUMPS

MACMILLAN PIONEERS AGAIN!

New 1-Quart Container Without Metal for RING-FREE MOTOR OIL!

NON-REFILLABLE

HERE IT IS! The quart container for motor oil which motorists and dealers have been expecting!

And it's Macmillan who pioneers again! A "can" without metal for RING-FREE!

With the steel mills converted to war purposes, the supply of metal cans for oil has dwindled and virtually disappeared. That was natural and right.

But motorists, wanting to be sure of getting RING-FREE—in its own quickly identified quart containers—have been hoping that this difficult packaging problem would be solved.

Now the new quart is ready! Now every *independent* dealer selling RING-FREE can open this new container and put in the fill of RING-FREE every car has been thirsting to get!

Among other things, Macmillan pioneered with RING-FREE motor oil ten years ago. There never has been an oil like it. There can't be, because it's refined by an exclusive, patented process.

That's why it removes carbon, saves as high as 10 per cent on gas, reduces friction fast, saves wear and repairs and lengthens the life of your car.

Now Macmillan pioneers again—after months of search and research—bringing out a metal-less container to assure motorists of getting RING-FREE!

The Macmillan sign is shown at *independent* filling stations, garages, and car dealers. Drive in and get your fill of RING-FREE today!

MACMILLAN
RING-FREE
MOTOR OIL

35c
A QUART IN U.S.A.

MACMILLAN PETROLEUM CORPORATION
50 West 50th Street, New York
624 South Michigan Avenue, Chicago • 530 W. 6th Street, Los Angeles

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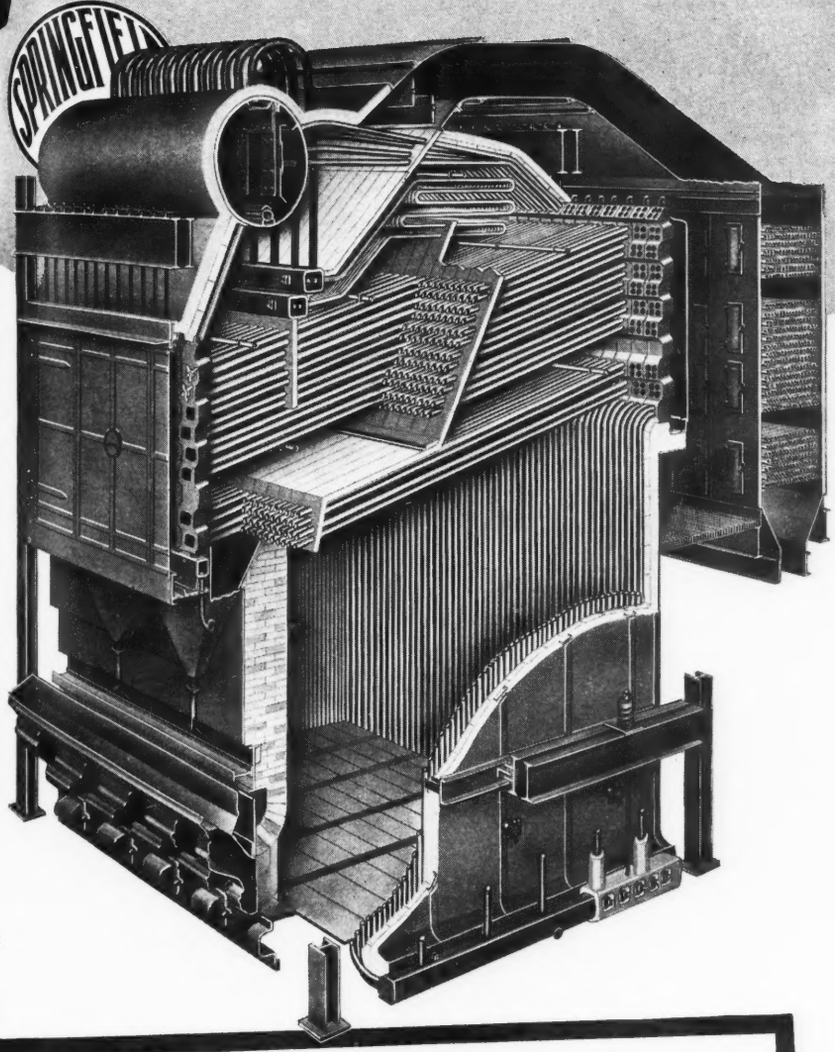
POWER is needed NOW!



HERE'S HOW SPRINGFIELD HELPS GET PLANTS *Going Sooner!*

FIELD records on war plant construction show that Springfield boilers can be *installed 30 to 60 days sooner* than other types! This speed up is made possible primarily by exclusive features of Springfield design:

Shop Assembled Sections. Sections of 3" tubes rolled into electric cast steel headers are assembled complete with baffles in our shop saving weeks in field construction. Water walls also shop assembled where field conditions permit.

Each section is hydrostatically shop tested at pressures at least 50% over working pressure and never less than 500 lbs. Springfield's distinctive 4-tube grouping arrangement, combined with sinuous headers give each section rigidity and strength to withstand handling in shipping and in the field.

Complete 90% of Installation Before Single Drum Arrives. Delays in getting steel plates for drums is a minimum retardant on Springfield jobs. The setting can be put in, tubes, headers, water walls, auxiliaries installed—all before the drum arrives for connection. And Springfield's single drum design requires considerably less critical steel than multiple drum designs.

Delivery. Springfield shops are not loaded up with mass production of standardized boilers. Prompt attention can be given to units to meet the most special needs. Ask for further facts, now. SPRINGFIELD BOILER CO., 1953 E. Capitol Ave., Springfield, Illinois.

DUPLICATE UNITS
SAVE ENGINEERING AND SHOP TIME

Complete drawings, patterns, shop fixtures, etc., are on hand to duplicate any of the many modern Springfield steam generating units built in recent years. Capacities from 5,000 lbs. to 450,000 lbs. per hour, or more. Pressures from 75 lbs. to 750 lbs., or higher. Springfield regularly takes contracts for complete steam generating units.

SPRINGFIELD

STEAM GENERATING UNITS

SPRINGFIELD BOILERS

ANY SIZE ANY FUEL ANY PRESSURE

HOMESTEAD LEVER·SEALD VALVES ARE

STICK·PROOF

and how!

Homestead Lever-Seald Plug Valves assure *continuous, never-failing* control at lowest cost.

They *always* work. Corrosive or viscous fluids, extremes of temperature and pressure, and similar conditions that cause ordinary valves to "stick," cannot make "Homesteads" inoperative.

Built into each of these valves is a powerful leverage (lower lever), which relieves seating pressure between plug and body just enough to overcome friction, and permit easy turning. Then *a quarter-turn* of the upper lever fully opens or closes the valve; and full seating pressure is again applied by the lower lever to make a positive leakless seal.

Thus, right on each Homestead Lever-Seald Valve, a part of it at all times, is the mechanism which makes possible continuous, unfailing, positive operation.

Homestead Lever-Seald Valves are made in semi-steel, steel, or bronze, sizes 1½" to 10", for pressure ranges from 150 pounds to 1500 pounds. Write for Valve Reference Book No. 38.

WHY HOMESTEAD "LEVER-SEALDS" ARE BETTER VALVES

- √ Instant, positive, unfailing operation under all conditions.
- √ Quarter-turn of upper lever fully opens or closes valve.
- √ Positive sealing without lubrication.
- √ Seating surfaces protected in all positions.
- √ Straight-line fluid flow for unobstructed passage and minimum pressure drop.
- √ Sealed bottom and deep stuffing box prevent outside leakage.

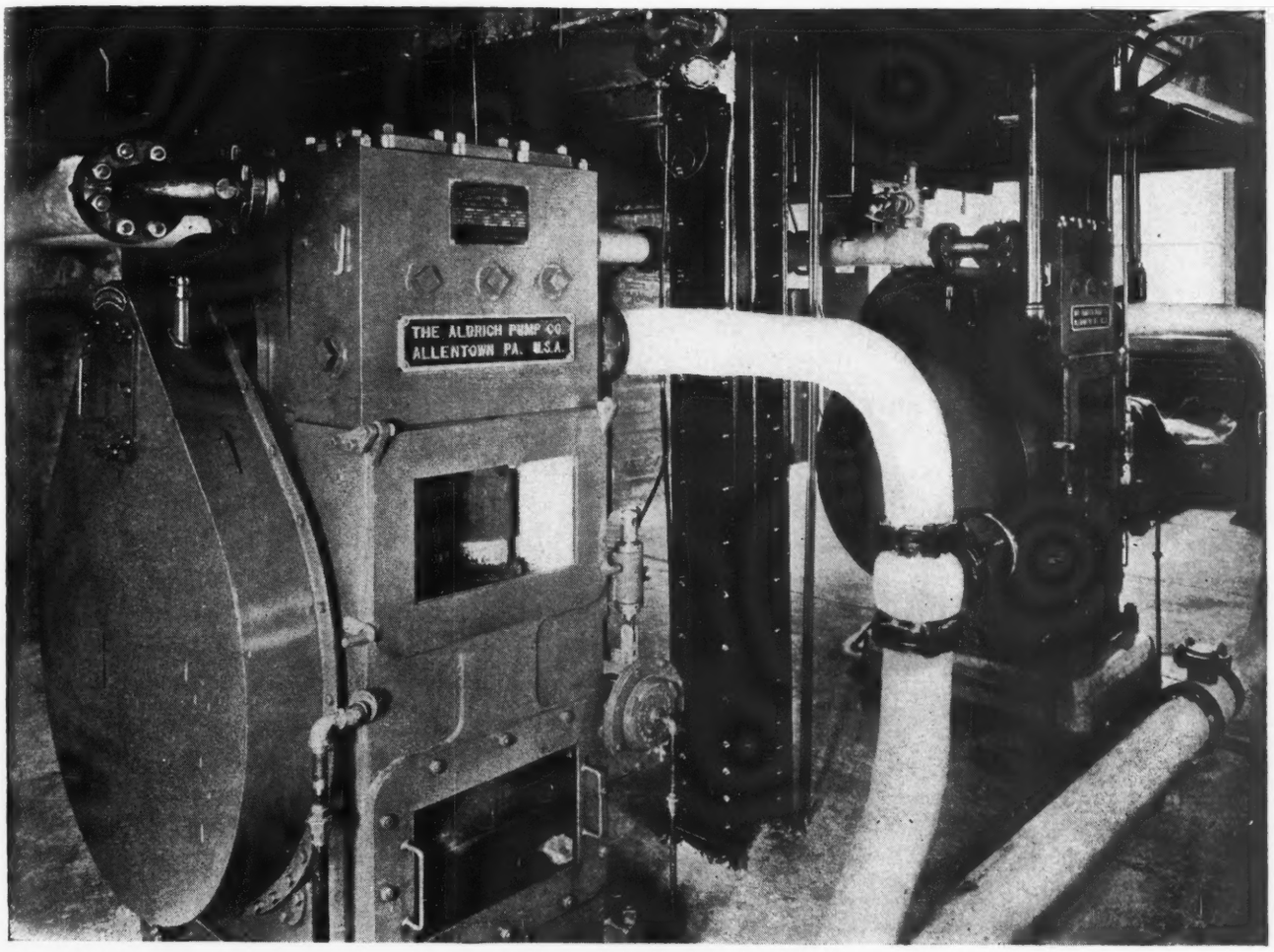
HOMESTEAD VALVE MFG. CO.

MAKERS OF "PEAK PERFORMANCE" VALVES FOR 50 Years 1892 1942

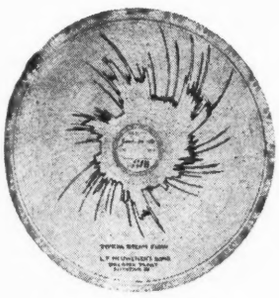
P. O. BOX 210 • • • CORAOPOLIS • • • PENNSYLVANIA

THESE ALDRICH-GROFF "POWR-SAVR" PUMPS...

TRADE MARK



... hold boiler water levels to close limits!



Typical Steam Flow Chart for a 24-hour period showing the widely varying steam demands from boilers fed by Aldrich-Groff Controllable Capacity "Powr-Savr" Pumps in a large eastern brewery.

EVEN with the widely fluctuating steam demands as indicated in the steam flow chart at the left, two ALDRICH-GROFF Controllable Capacity "Powr-Savr" Pumps have automatically maintained boiler water levels within one inch of the desired point as consistent practice during the more than 2 years of their operation to date. Each of these 0-to-4" *variable-stroke* vertical triplex pumps is driven by a 20-HP constant speed motor and feeds *one* 40,000-lb. per hr. boiler, with power consumption almost directly proportional to pump delivery.

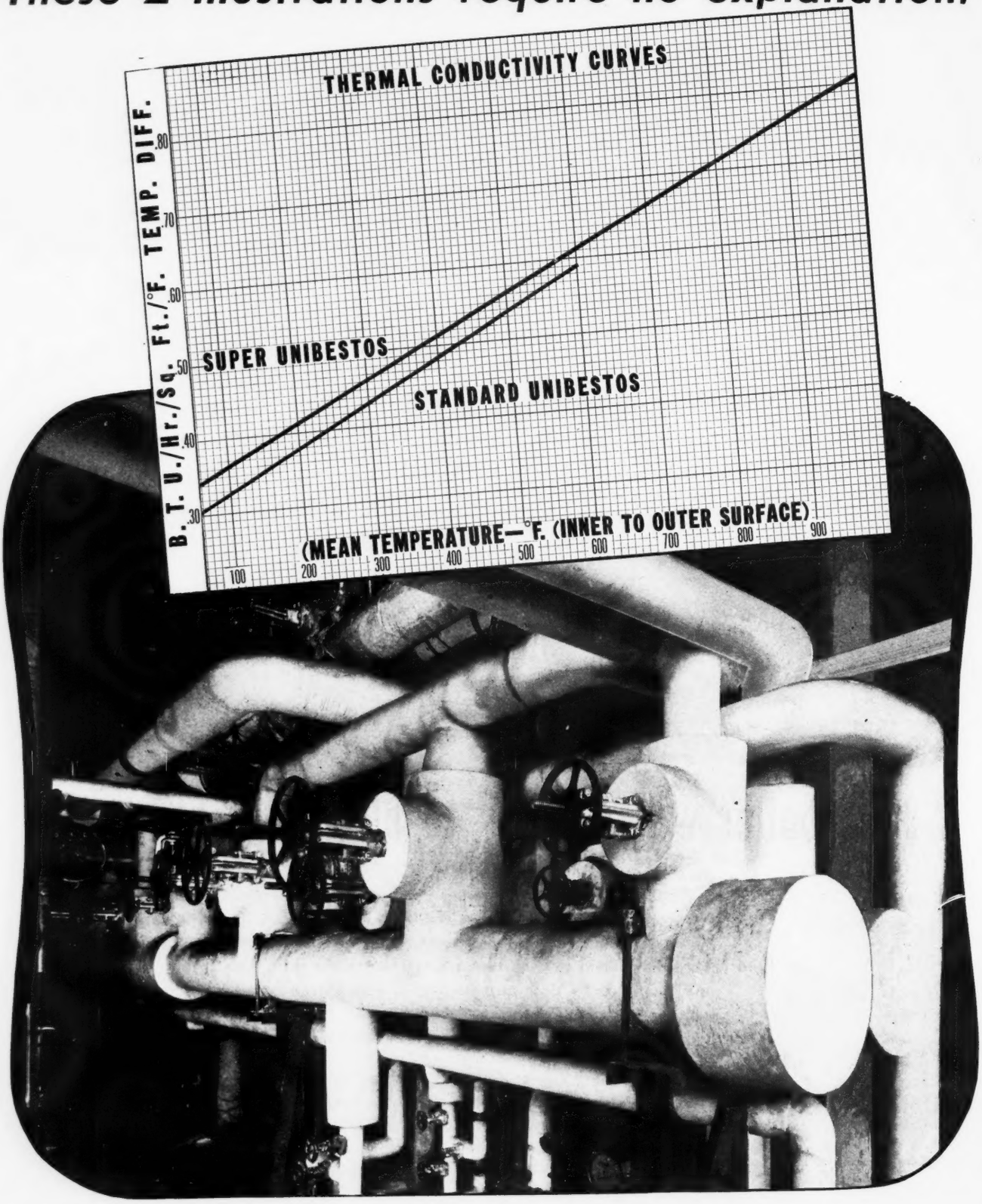
The use of these pumps with *unit feed systems* eliminates the pressure and power losses associated with throttling-type feed-regulating valves. The pump offers the advantages of feed system simplicity, efficiency and mechanical reliability for the small and medium boiler plant using medium and high steam pressures, and for *de-superheater feed service* in even the largest power stations.

And at sea these same advantages have called for the installation of Aldrich-Groff "Powr-Savr" Pumps on more than 100 ships.

Write today for bulletins and material giving full details, sizes and ratings of Aldrich-Groff Pumps.

THE ALDRICH PUMP CO. **3 GORDON STREET ALLENTOWN • PENNA.**

These 2 illustrations require no explanation!



UNARCO

unibestos is available in Standard material, for temperatures up to 750°; Super, with a temperature limit of 1200°; Combination, with a temperature limit of 1200°. These temperature limits permit the use of one material at maximum efficiency for a wide range of purposes. Unibestos is available in half sections up to 30" pipe diameter and from 32" to 60" in quadrants from ¾" to 5" in thickness. Standard and Super are available in single layer construction with provision for expansion in piping, where required.

Conserving the Vitamins of Industry: B.T.U.'S!

UNION ASBESTOS & RUBBER CO.

1821 SO. 54th AVE., CICERO, ILL. · 420 LEXINGTON AVE., NEW YORK · 116 NEW MONTGOMERY ST., SAN FRANCISCO

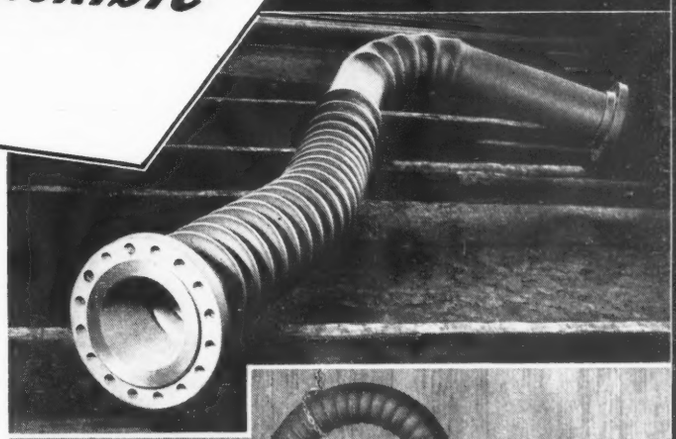
LET PIPING *Flex* ITS SINEWS TO REDUCE STRESS—SAVE SPACE

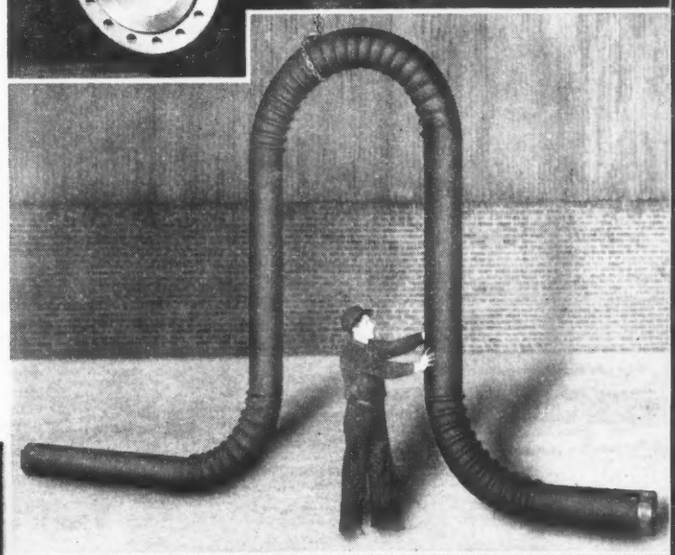
USE PITTSBURGH PIPING Creased Bends and Super-Flexible Corrugated Tangents

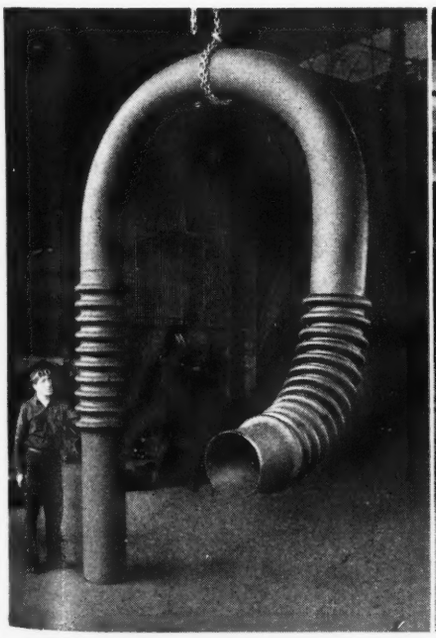
BY the proper use of creased bends and corrugated straight pipe sections, a piping system's resistance to movements caused by thermal expansion will be materially reduced. This greatly increased flexibility inherent in this type of piping makes possible . . . the use of shorter lines without excessive stresses and end reactions against equipment . . . short radius bends . . . more convenient location of valves . . . and all-round more compact and efficient piping system.

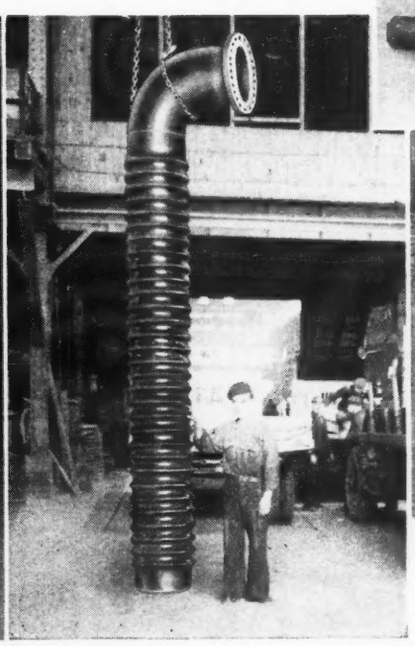
Due to the flexing of the corrugations, a straight length of corrugated pipe will offer only 1/5 as much resistance to bending as a straight pipe of the same length and size.

As the illustrations on this page show, Pittsburgh Piping Creased and Corrugated construction is applicable to practically any piping design. Our engineers will be glad to show you how it can be used to advantage in your next piping.









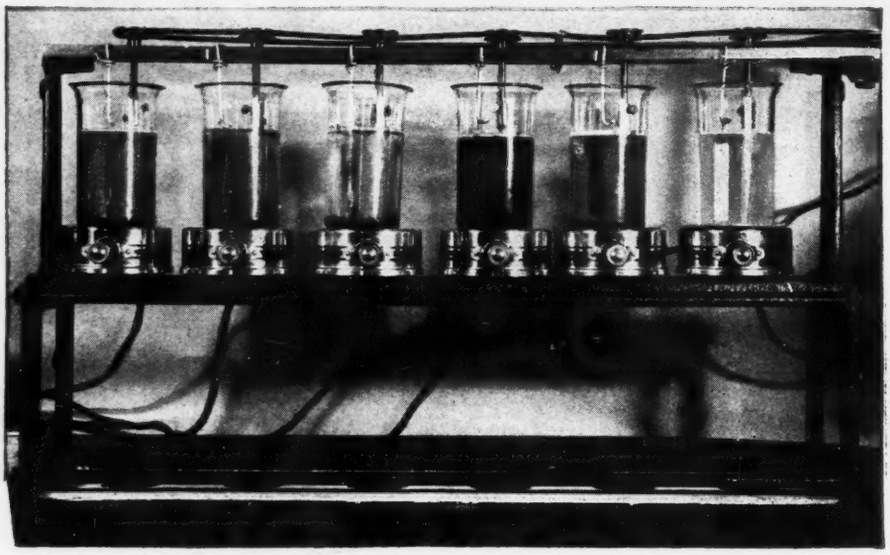
PITTSBURGH PIPING & EQUIPMENT CO., 10 FORTY-THIRD ST., PITTSBURGH, PA.

Woolworth Building, New York
Occidental Building, Indianapolis
Peoples Gas Building, Chicago
Union Guardian Building, Detroit
Public Square Building, Cleveland
10 High Street, Boston
525 Market Street, San Francisco

★

(This test was described in a Shell Turbo Oil advertisement dated January, 1941)

★



The Turbine Oil that PREVENTS Rust!

These six steel test strips prove Shell Turbo Oil positively prevents rusting. All six strips were immersed for 48 hours at 167° F. in well-known turbine oils, mixed with 10% of distilled water and continuously agitated at 1200 R. P. M. Right-hand strip, immersed in Shell Turbo Oil under these severe test conditions, shows no rust. All of the other strips rusted badly.

PUBLISHED by the AMERICAN SOCIETY FOR TESTING MATERIALS AS TENTATIVE STANDARD . . .

a turbine oil rusting test

AT ITS 1942 ANNUAL MEETING, the American Society for Testing Materials adopted as tentative standard D665-42T, a turbine oil rusting test similar to that shown above.

Here is *official* recognition of the importance of the rust-preventive effect of modern turbine oil! For more than two years, the superiority of Shell Turbo Oil in preventing rust has been consistently proved by the test illustrated.

Two other features of Shell Turbo Oil, *high oxidation stability*, and *minimum foaming tendency*, make it equal to every requirement of modern turbine lubrication.

SHELL

SHELL TURBO OIL

Vogt

for better DROP FORGED STEEL Fittings in SOCKET WELD and SCREW END TYPES

SOCKET WELD TYPE

Schedule 40—(Standard)
Schedule 80—(Extra Heavy)
Schedule 160 & Double Extra Heavy
Sizes 1/4" to 6"

Choose either type with Confidence, when Drop Forged by **VOGT!**

Vogt drop forged material is uniform in structure, fine grained and free from porosity, with a "plus" of strength and toughness that safely withstands the strains and shocks of service at high temperatures and high pressures. Ells, Tees, Crosses, etc., are available in various alloys to meet any of your special service conditions.

WRITE FOR BULLETINS OR ANY SPECIAL INFORMATION

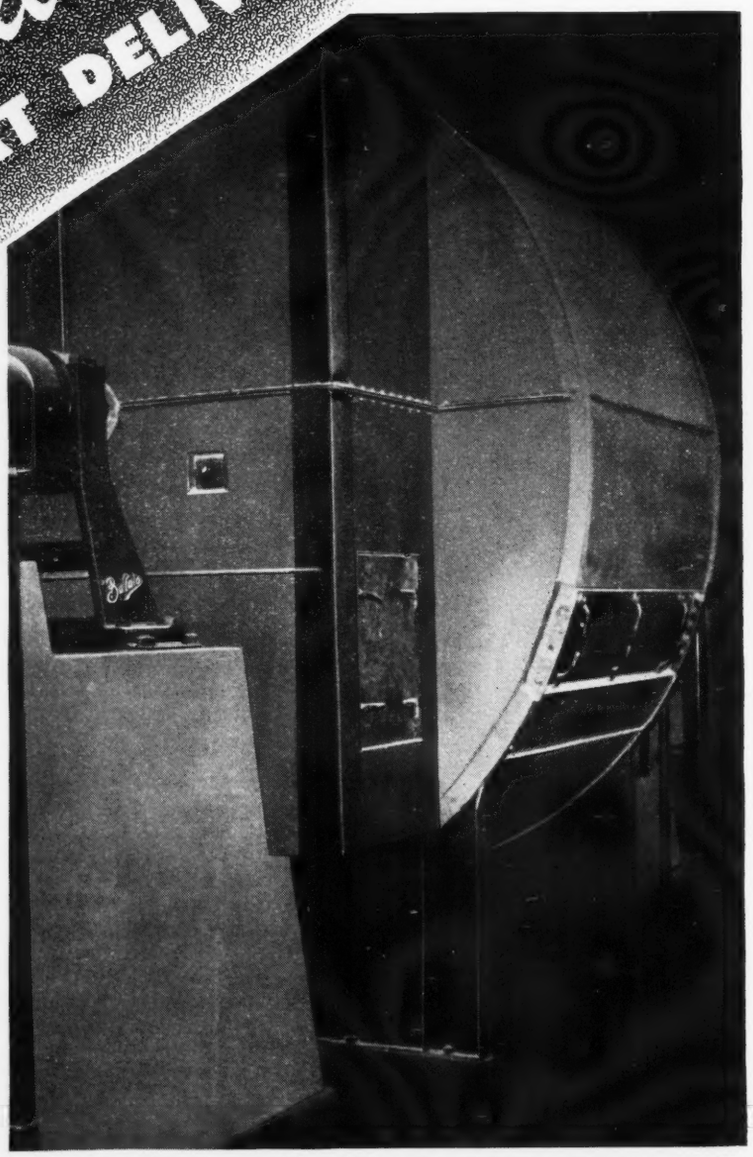
SCREW END TYPE

2000 pound 3000 pound
6000 pound
Sizes 1/8" to 6"

HENRY VOGT MACHINE CO., Incorporated, LOUISVILLE, KY.

BRANCH OFFICES: NEW YORK · PHILADELPHIA · CLEVELAND · CINCINNATI · ST. LOUIS · CHICAGO · DALLAS

It's details like this THAT DELIVER!



● Just a small detail in the construction of a Buffalo Mechanical Draft Fan — riveting a blade to the center plate of a fan rotor. But, like all Buffalo details, it commands the attention of skilled craftsmen. It is this respect of detail, from drafting board thru to the finished fan, which gives Buffalo Fans stamina to spare—even in the severest emergencies.

BUFFALO FORGE COMPANY

488 Broadway **Buffalo, N. Y.**

Branch Offices in Principal Cities
Canada Pumps, Ltd., Kitchener, Ont.

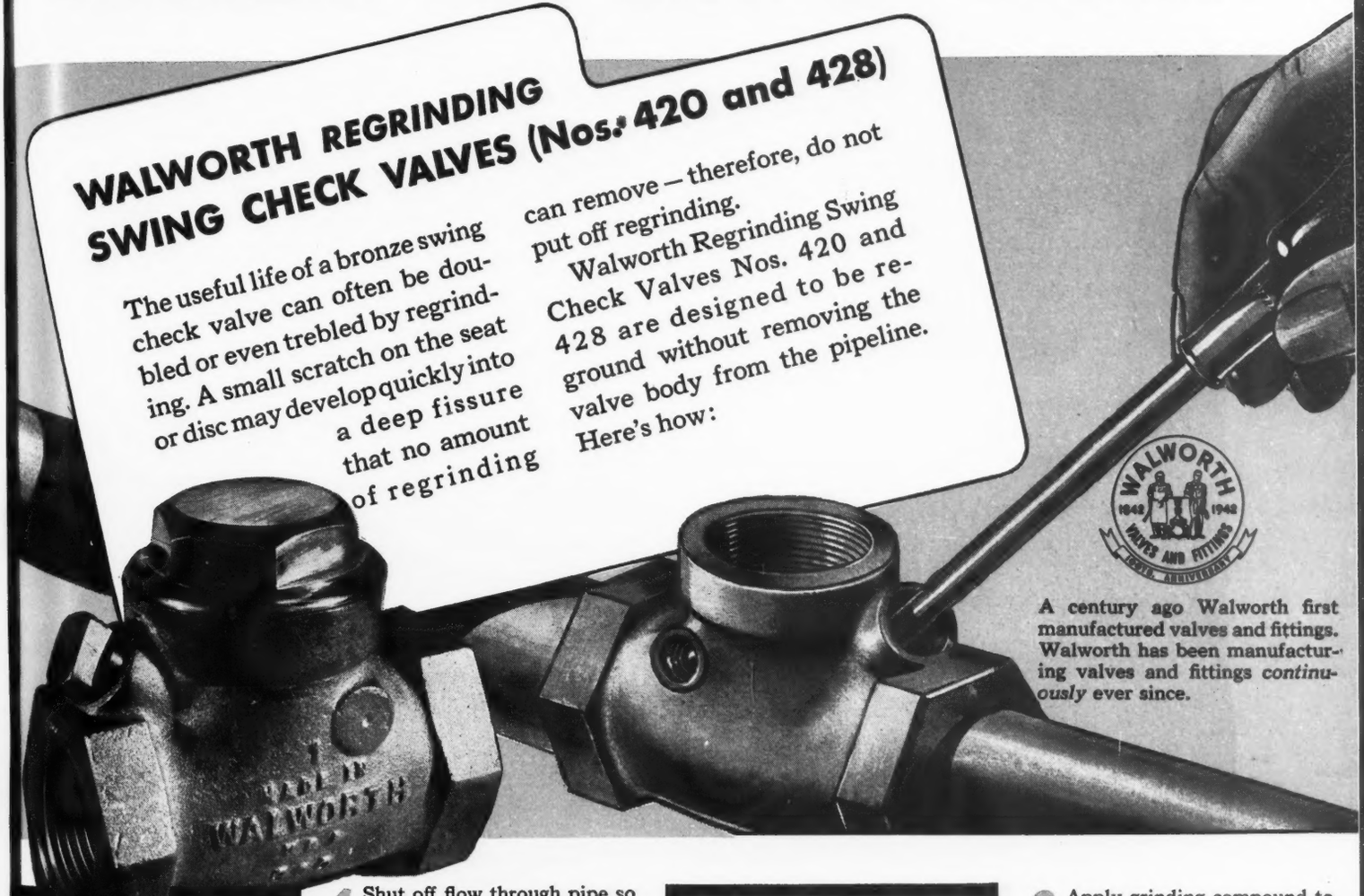
"Buffalo" MECHANICAL DRAFT FANS

DOUBLE THE LIFE OF YOUR..

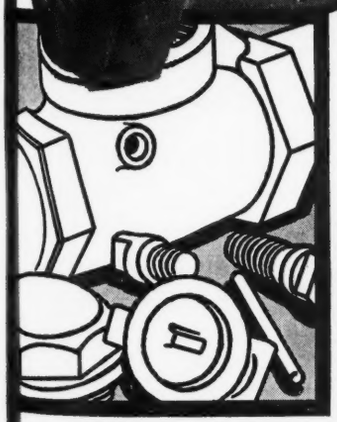
WALWORTH REGRINDING SWING CHECK VALVES (Nos. 420 and 428)

The useful life of a bronze swing check valve can often be doubled or even trebled by regrinding. A small scratch on the seat or disc may develop quickly into a deep fissure that no amount of regrinding can remove — therefore, do not put off regrinding.

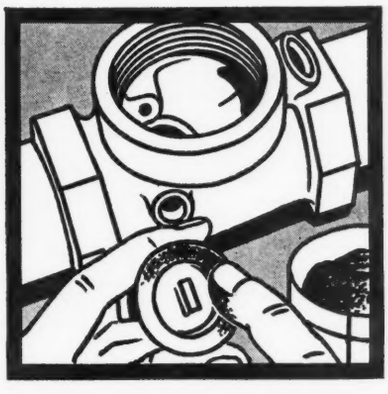
Walworth Regrinding Swing Check Valves Nos. 420 and 428 are designed to be ground without removing the valve body from the pipeline. Here's how:

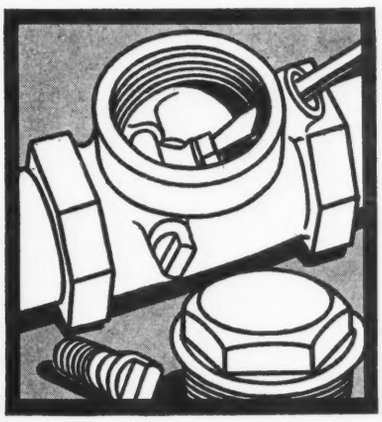


A century ago Walworth first manufactured valves and fittings. Walworth has been manufacturing valves and fittings *continuously* ever since.

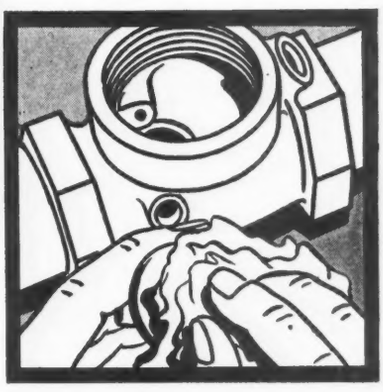


1 Shut off flow through pipe so that section being worked on is empty. (A) Remove the cap from the top of the valve and (B) remove stop plug on the downstream end of the valve; (C) remove plug on side of body and pull out hinge pin; (D) remove disc.





2 Apply grinding compound to disc and seat with finger. It is recommended that a grinding compound with an emery base be used.



Replace disc and put screw driver through stop plug hole til screw driver fits into slot top of disc stud. Oscillate disc til pitted surfaces are ground ooth.

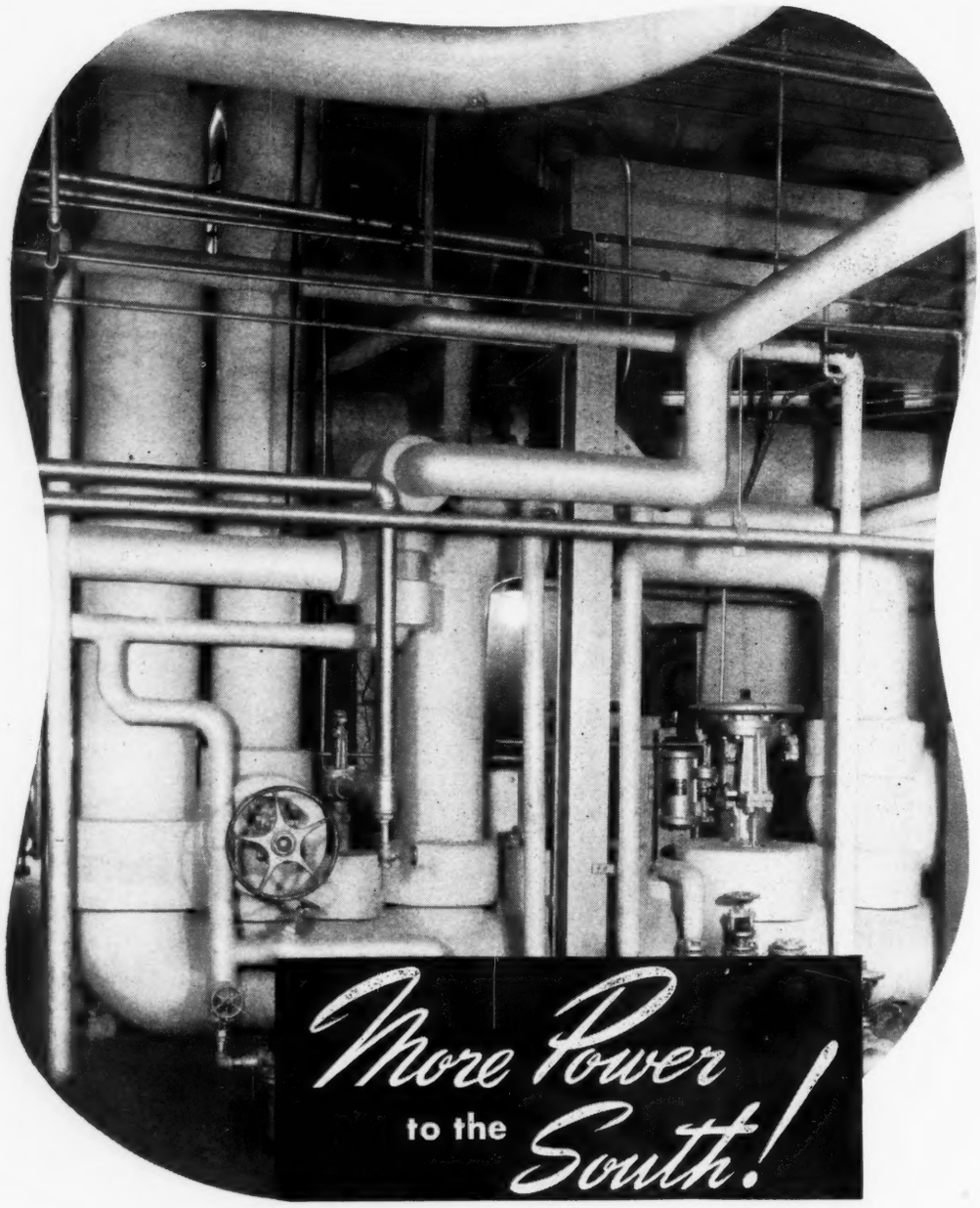
4 Remove disc and wipe seat and disc with cloth dipped in gasoline — be sure all grinding compound is removed; then reassemble. Your valve is ready for additional useful service.

WALWORTH

WALWORTH COMPANY
60 EAST 42nd STREET, NEW YORK

VALVES
FITTINGS
and TOOLS
Backed by 100 Years' Service

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD



The industrial growth of the South, plus the coming of numerous war industries and military activities, have called for a large increase in the power output of that region. Southern utilities have anticipated this condition and prepared to meet the new demands by expansion and modernization programs.

Carey Insulations have demonstrated their high performance and superior impact strength in service all over the nation. They are the latest developments of research and experience. Whatever your insulation needs, you're always SAFE with CAREY. A nationwide organization is at your command. For details, address Dept. 16.

THE PHILIP CAREY MFG. COMPANY • Lockland, Cincinnati, Ohio
Dependable Products Since 1873
IN CANADA: THE PHILIP CAREY COMPANY, LTD. Office and Factory: LENNOXVILLE, P. Q.

SHIPS FOR VICTORY
OVER 750 LIBERTY SHIPS
will be equipped with
KELLOGG MAIN CONDENSERS
HEAT TRANSFER DIVISION
THE M. W. KELLOGG COMPANY
JERSEY CITY, N. J.
225 BROADWAY, N. Y.
Aircraft Carriers and Destroyers use KELLOGG prefabricated High Pressure Piping

KELLOGG

THE M. W. KELLOGG COMPANY
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"Masterflex" Prefabricated Piping Systems · **"Masterweld"** pressure vessels for Power, Refinery and Chemical Industries. Heat Exchangers. Pyrolytic and Catalytic Cracking Units, Reforming, Dehydrogenation, Alkylation, Desulphurization. Thermal and Catalytic Polymerization Units · **JUIK Processes** for Lubricating Oil Plants. Plastic Refractories · Radial Brick Chimneys.

Still More Answers to WHO IS DOING WHAT *with*

AN ALL-ELECTRIC ADJUSTABLE-SPEED DRIVE for A-C. CIRCUITS

RELIANCE V★S DRIVE

Speed Ranges up to 16 to 1
Sizes — 1 to 30 hp.

1 SPEED CONTROL CONVENIENCE WITHOUT LIMITATIONS. Place speed-changer and start-stop button at any convenient point to which a wire can be run. Control is within easy reach.

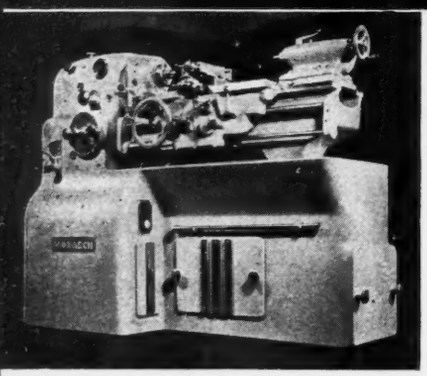
2 DIRECT DRIVE. Lower cost, because fewer parts (no intermediate speed-changing device). Power is closer to where it is needed. Use less space. Streamline your machine design.

3 FROM A-C. POWER SUPPLY. The "packaged" V★S Speed Control Unit brings you important advantages at a new low price. Mount it anywhere. Simply connect it by three wires to a 3-phase a-c. circuit.

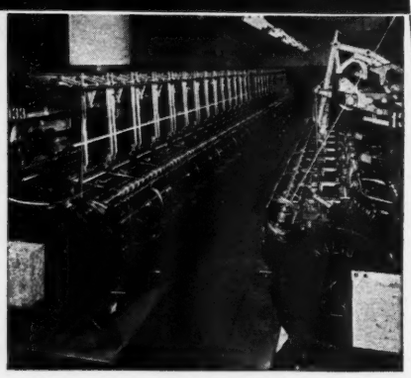
Other Production Aids Quick stopping, reversing, speed-setting, safe speeds for threading, ample starting torque with smooth acceleration.

Get Bulletin 310 for details

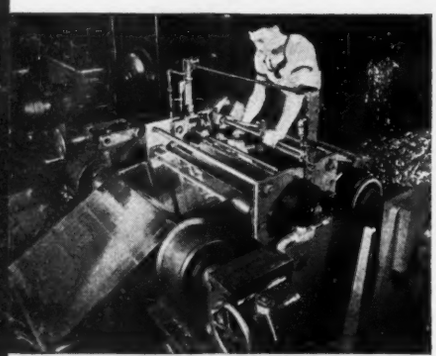
RELIANCE ELECTRIC & ENGINEERING CO. • • **CLEVELAND, OHIO**
1082 IVANHOE ROAD
Sales Offices in Principal Cities



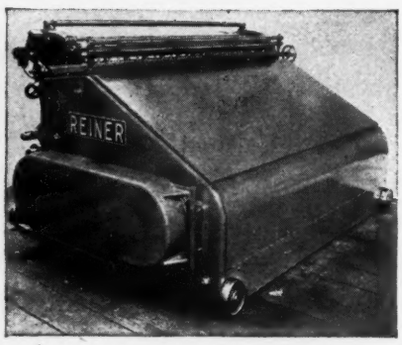
TOOL ROOM LATHE—A machine-tool maker designed a new 10-inch all-electric precision lathe with all elements of the Reliance V★S Drive built in as integral parts of the machine. Provides a smooth range of spindle speeds from 5 to 2500 r.p.m. indicated by a magnetic type tachometer on front of lathe headstock.



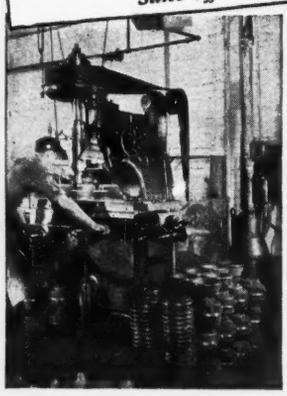
HOSIERY MACHINE—The Reliance V★S Drive for this full-fashioned hosiery machine is arranged for "program" control. Separate speed control handles are set to suit five different operations; speeds change automatically as each operation is finished.



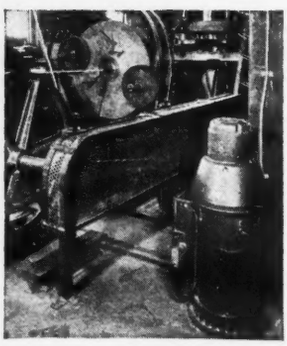
FOIL WINDER—A producer of aluminum foil gets smooth acceleration from a low threading speed to the top operating speed with a 5 hp. 148-1150 r. p. m. Reliance V★S Drive. Fewer breaks when winding mean more production.



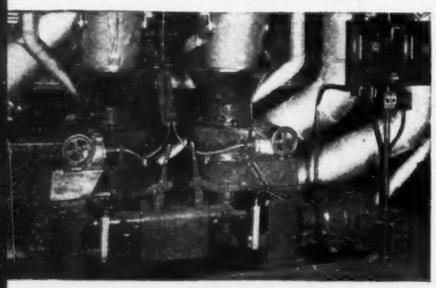
BEAMING MACHINE—A textile machinery builder made use of the V★S Drive to design a beamer on an entirely new principle. All elements of the Drive are enclosed within the machine. Provides stepless speed range from 50 to 1000 yards a minute; slow starting speeds; quick stopping.



MILLING MACHINE—A machinery builder put new life into an old milling machine by applying a 7½ hp. V★S Drive. With more power, a wider range of milling speeds and more convenient control the machine has become a bigger producer.



CABLE FORMING and WRAPPING—A V★S Drive replaced the system of gears and pinions formerly used to obtain speed changes for the taping head on this cable-forming and wrapping machine. Now, no time is lost in changing speeds. Product is more uniform.



STOKERS—V★S Drives are readily combined with instruments regulating temperatures and pressures so that speeds change automatically. The drives on these coal feeders change their pace as required to keep steam pressure constant.

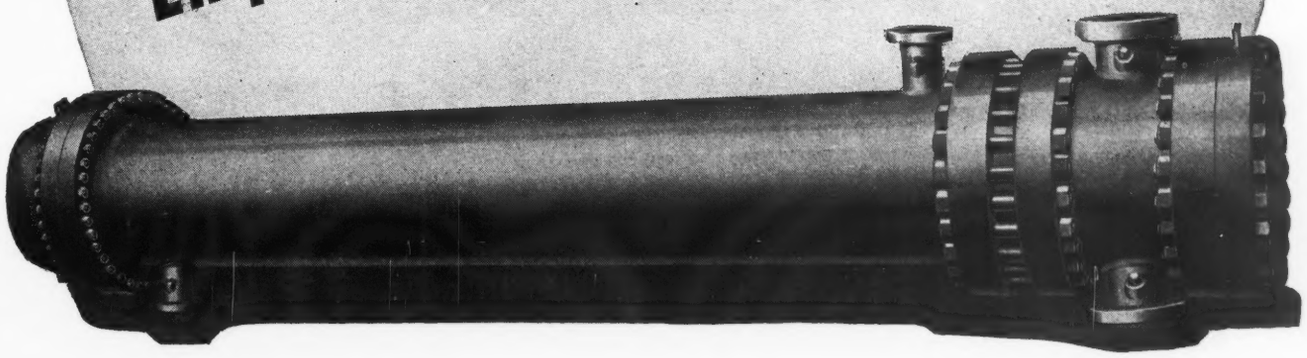
BODY-CHASSIS ASSEMBLY—An automobile plant synchronizes the travel of body and chassis assembly lines by using Reliance V★S Drives. An operator, seated where the lines join, speeds up or slows down the overhead body conveyor so that the body can be dropped into place on the chassis.

RELIANCE ELECTRIC & ENGINEERING CO. • 1088 Ivanhoe Road, Cleveland, Ohio

BIRMINGHAM • BOSTON • BUFFALO • CHICAGO • CINCINNATI • DETROIT • GREENVILLE, S. C. • HOUSTON, TEX. • LOS ANGELES • MINNEAPOLIS
NEW YORK • PHILADELPHIA • PITTSBURGH • PORTLAND, ORE. • ST. LOUIS • SAN FRANCISCO • SYRACUSE, N.Y. • AND OTHER PRINCIPAL CITIES

RELIANCE A-C D-C MOTORS

FEED WATER HEATERS
. . . In All Pressure Ranges Employed in Modern Power Plant Design



In numerous power plants, feed water heaters of Lummus design and construction are operating at pressures up to 1200 pounds. Lummus heat exchangers of the same type of construction are operating at pressures up to 2200 pounds.

In addition to feed water heaters of improved design, Lummus offers public utility and power plants, surface condensers, evaporators, ejectors and similar equipment to meet specific conditions. Write for further information.

THE LUMMUS COMPANY • 420 LEXINGTON AVE., NEW YORK, N.Y.

LUMMUS

FEED WATER HEATERS

Take a Page from the Aviation Industry's Experience with

FIRE PROTECTION

● Is fire a greater calamity in a power plant or an airplane factory? The best answer is probably "*Fire damage is the greatest calamity wherever it could have been prevented.*" . . . And fire losses CAN be prevented, today, by Cardox extinguishment.

Aircraft industries, growing by leaps and bounds, have been in an ideal position to make most new Cardox installations. Under the Government's plane building program there was no leeway in *time* or *material* for damage *in any way preventable.* Cardox engineered applications were proved to offer maximum-protection.

Cardox Systems with a full range carbon dioxide capacity—500 lbs. to many tons—plus positive controls, are reducing fire risk to insignificance, in many other industries. Evidence can be presented to manufacturers in many fields that Cardox, when adapted to their individual hazards, is *all-out fire protection.*

Write for Bulletin 10112.

How Cardox Systems Extinguish Fires

- Timed discharges, as needed, through built-in piping systems . . . supplied instantly from a single storage unit holding tons (if required) of liquid Cardox CO_2.
- Mass discharge of Cardox CO_2 "knocks out" fire, by . . .
- Reducing oxygen content of the atmosphere below the concentration necessary for combustion, and . .
- Cooling combustibles and fire zone below ignition temperature . . .
- Extinguishing fire quickly and completely *without* damage from extinguishing medium.

CARDOX—CO_2 Systems with Enhanced Fire Extinguishing Performance

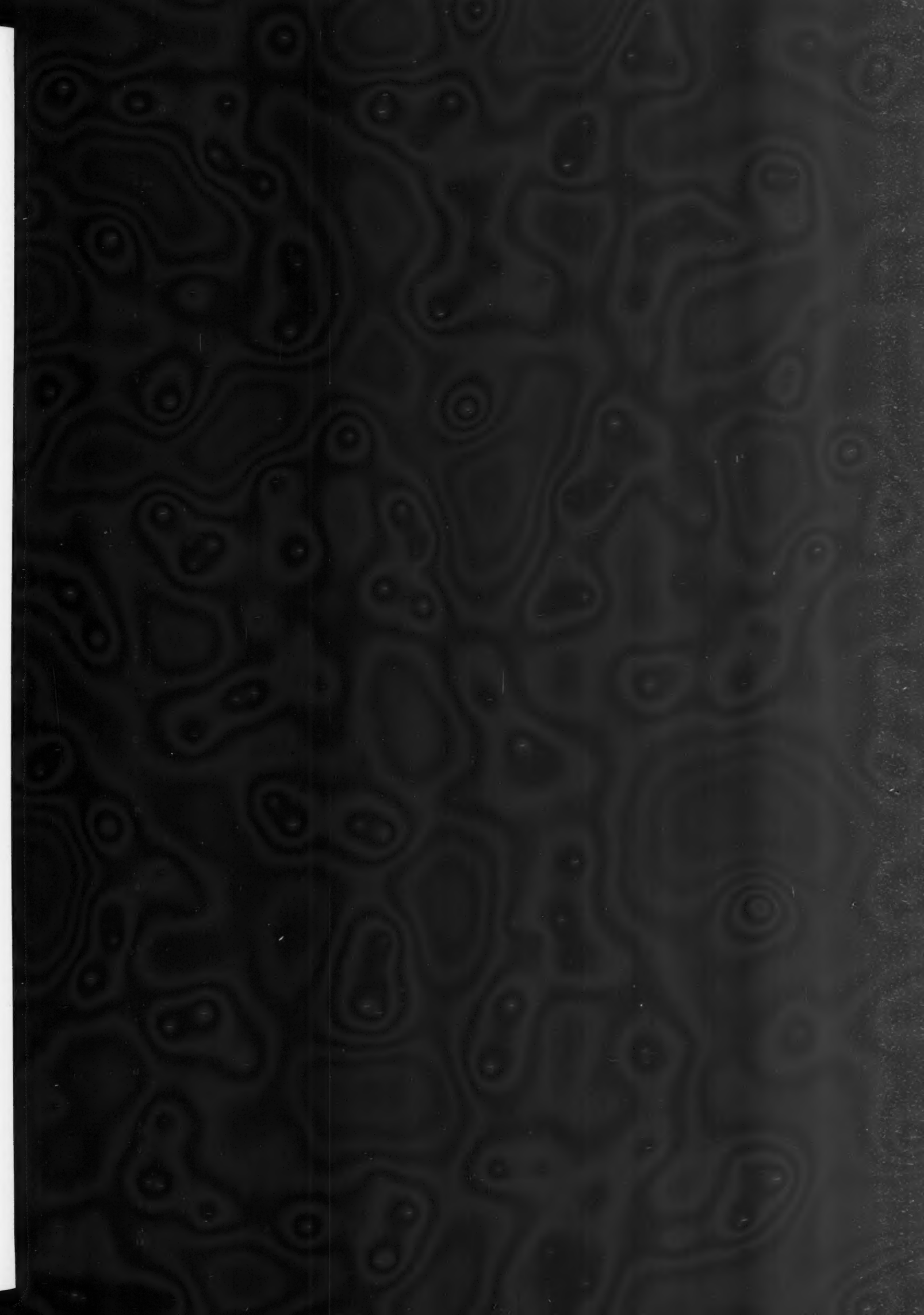
A. Uniformity of CO_2 characteristics.
B. Extinguishing medium with uniformly greater cooling effect.
C. Accurate projection of CO_2 through greater distances.
D. Timed discharges, as needed, through built-in piping systems . . . supplied quickly from a single tank holding tons of liquid Cardox CO_2.

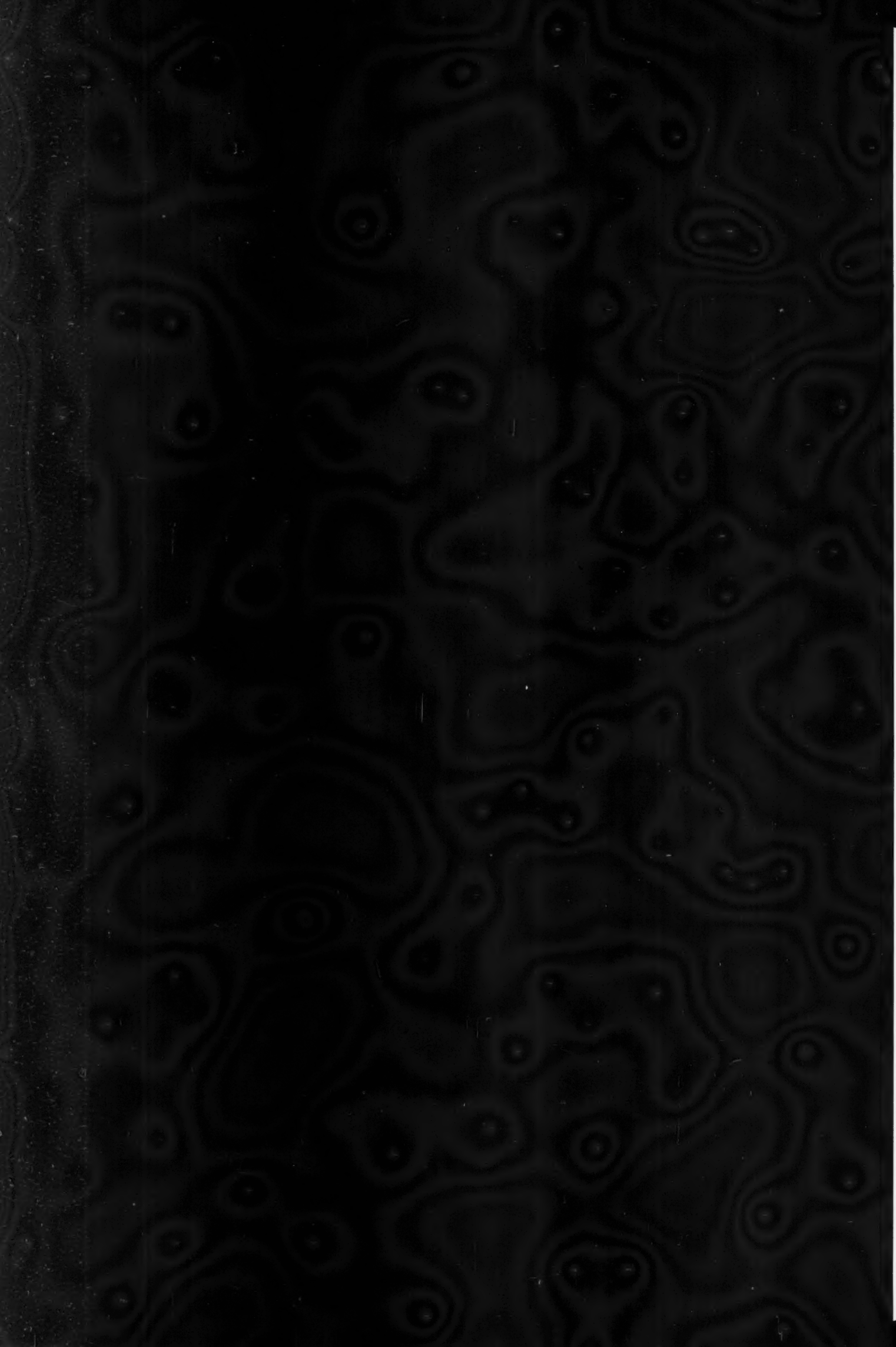
CARDOX CORPORATION ● BELL BUILDING, CHICAGO, ILL.

District Offices in New York • Detroit • Pittsburgh • Cleveland • Atlanta
San Francisco • Los Angeles • Seattle

CARDOX

NON-DAMAGING FIRE EXTINGUISHING SYSTEMS AND TRUCKS





This Valve never had a chance!

DOOMED TO DESTRUCTION
when tell-tale leakage went unheeded . . . .

THIS Iron Body Gate Valve was closed with scale or other foreign matter lodged between the seat ring and wedge faces. If the leakage resulting from this condition had been heeded, and the valve properly inspected, the damage could have been prevented. Instead, unchecked leakage over a long period developed wire drawing effects. When belated inspection was made, the parts were so badly eroded replacement was essential.

Such neglect is a frequent cause of gate valve failure. Guard against this destruction by blowing out pipe lines freely as often as necessary, and by immediate inspection whenever leakage occurs.

In today's emergency, valves must be kept in efficient operation, not only to avoid production slow-downs, but to conserve valve metals, all of which are in urgent demand for actual weapons of war. New valves can be obtained only for certain uses which are vital to the war effort. Many valves in present use must be kept in service until the war is won.

The well-known "ounce of prevention" is worth a pound of cure in valve maintenance. Inspect them frequently, systematically. Repair or replace worn parts before resultant deterioration begins. Be sure new maintenance men are thoroughly instructed. Select new valves for approved construction with extra care, and see that they are installed properly by experienced workmen.

Check up on your program of valve conservation and see that it is adequate to the present emergency. Jenkins Engineers will give you complete cooperation.

Army-Navy "E" Pennant, awarded to Jenkins Bros. for high achievement in the production of war equipment.

Jenkins Bros., 80 White Street, New York, N. Y.; Bridgeport, Conn.; Atlanta, Ga.; Boston, Mass.; Philadelphia, Pa.; Chicago, Ill.; Jenkins Bros., Limited, Montreal; London, England.

JENKINS VALVES

For every industrial, engineering, marine and power plant service . . . in Bronze, Iron, Cast Steel and Corrosion-Resisting Alloys . . . 125 to 600 lbs. pressure.

CAST IRON FLANGES

CAN BE SUCCESSFULLY SUBSTITUTED IN MANY PLACES

The war demands for forged steel flanges are greater than the ability of the shops to supply them. And the steel required is badly needed for other war production. The result is a rapidly developing "bottleneck" in much essential piping.

Cast iron flanges, on the other hand, are usually available on suitable priorities. Cast iron screwed and lap-joint flanges can be substituted with complete satisfaction in many places where operating conditions do not exceed 250 p.s.i. pressures and saturated steam temperatures.

As a part of its war effort, the Pipe Fabrication Institute has made a study to determine where such steel-saving substitutions will be advantageous. Member fabricators are ready to make recommendations on cast iron flange substitutions which will not impair piping quality.

Qualified pipe fabricators can help you get your piping more quickly . . . and at the same time give maximum cooperation to the war effort.

THE PIPE FABRICATION INSTITUTE

Devoted to the Technical and Economic Problems in Piping

1108 CLARK BUILDING • PITTSBURGH, PA.

MEMO

TO... *Those Converting from Oil to Coal!*

DEAR MR. PATRIOT - - -

Have you our Stoker Operating and Maintenance Chart? If you have recently changed from Oil or Gas firing to Coal Stoker firing, in accordance with the expressed needs of Our Country at the moment, you will find this Chart helpful in conserving both fuel and equipment.

While compiled primarily for use with CANTON STOKERS, the information contained on these handy charts is invaluable to the operator of ANY underfeed stoker of similar type. Here, in brief, are the subjects covered in detail . . .

1. COAL . . . the types and sizes to use for best results . . . also combinations for maximum BTU's.
2. STARTING FIRES . . . the complete procedure, from checking boiler to tips on fuel distribution.
3. COAL ADJUSTMENT . . . the proper rates in accordance with type of fuel and load conditions.
4. AIR ADJUSTMENT . . . how best to set, so correct mixture can be achieved.
5. TO CLEAN FIRE . . . how and when to remove ash and clinkers.
6. CONTROLS . . . those employed, their use and care.
7. OBSTRUCTIONS . . . how to deal with foreign materials, which cause damage, in stokers.
8. HOPPER SMOKE . . . reasons why hopper smokes, and how to eliminate it.
9. BOILER DAMPER . . . how to adjust manually, or automatically.
10. CARE AND MAINTENANCE . . . all-over maintenance tips for best stoker results.
11. GENERAL INSTRUCTIONS . . . the way to get maximum economy from a stoker . . . how to make your complete boiler installation do a better job.

CANTON STOKER

If you have not yet made your conversion to Coal, CANTON's *54 sizes and types of Stokers* permit you to select the design best suited to your needs. A brief Summary follows:

54 Types of Stokers and Controls

(1) Vulcan Industrial Ramfeed—For the heaviest industrial loads—18 sizes and types specially designed to suit each application.

(2) Lo-Set Industrial Ramfeed—For medium industrial and heavy commercial jobs—18 sizes and types specially designed to fit each job.

(3) DeLuxe Industrial Wormfeed—For lighter industrial and medium commercial demands—10 sizes and types, built to fit each job.

(4) Standard Commercial Wormfeed — For lighter commercial applications—8 sizes and types, offer ample selection.

(5) Canton Synchronized Controls—For Ramfeed and Wormfeed Stokers—for automatically varying coal feed, forced draft and boiler draft to follow steam demand.

THIS IS DATA YOU NEED NOW, SO AS TO GET THE MOST FROM YOUR STOKERS . . . TO PREVENT NEEDLESS WASTE OF FUEL AND PRECIOUS PARTS, WHICH ARE HARD TO REPLACE. SEPARATE CHARTS AVAILABLE FOR WORMFEED AND RAMFEED STOKERS. WRITE FOR YOURS TODAY, SPECIFYING WHICH CARD YOU PREFER.

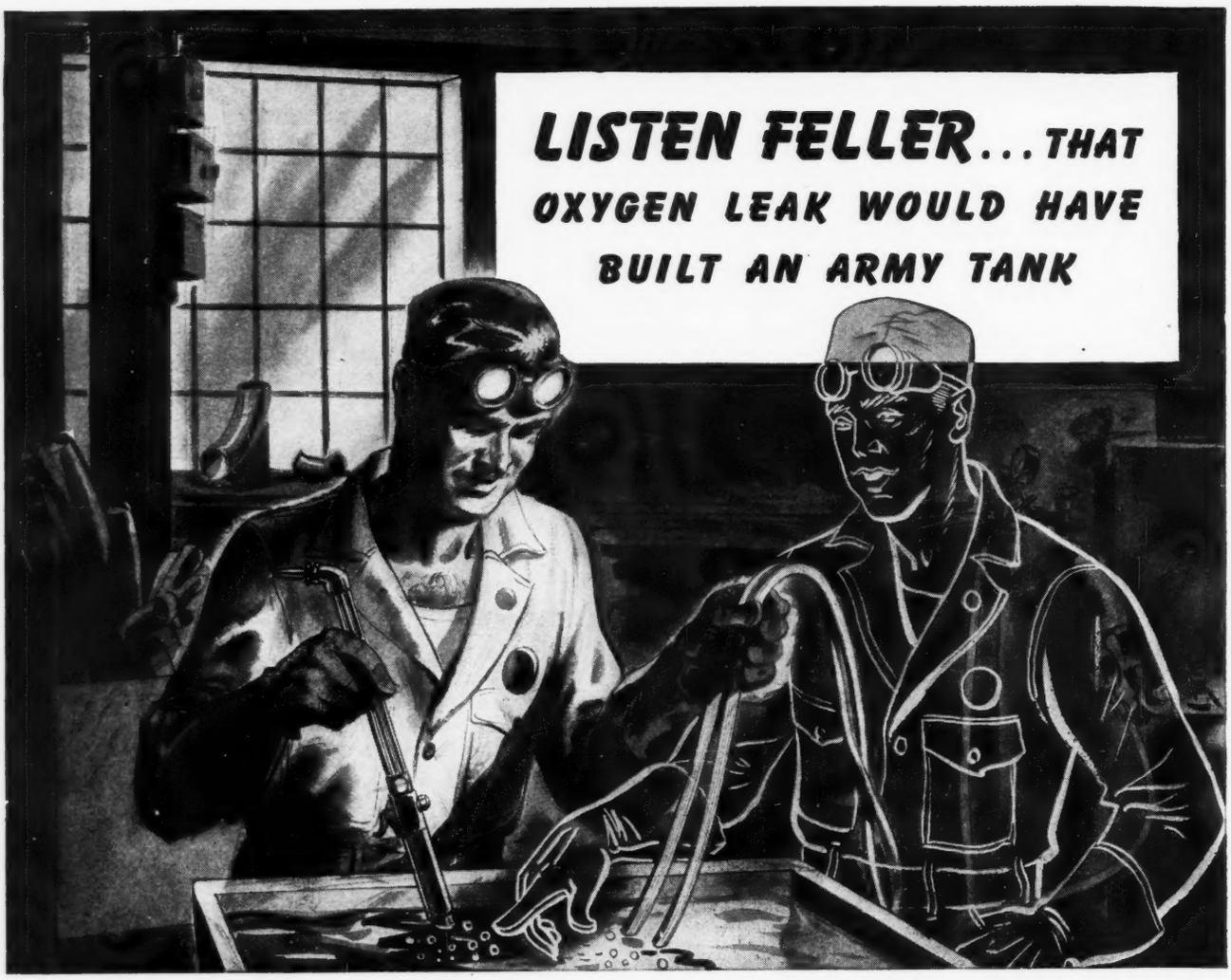
CANTON STOKER CORP.
Canton, Ohio

1. Send Wormfeed Stoker Chart .....
2. Send Ramfeed Stoker Chart .....
3. Send Data on Stokers .....

Boiler H.P. ..... Type .....

Signed .....
Address .....
State .....

CANTON STOKER CORPORATION
ANDREW PLACE, S. W., CANTON, OHIO



REPAIR ALL LEAKS IN HOSE AND CONNECTIONS

One leak as small as 1/64" in hose operating at 100 pounds pressure wastes 290 cubic feet of oxygen in 24 hours. It wouldn't take many days to waste enough to build an army tank.

That's why it is so important to conserve oxygen. Be on guard against these wasteful leaks — fix them promptly when they occur. In addition, do the following at regular intervals:

1. Inspect hose for leaks by immersing it in water—leaks occur most often near connections to regulator and torch.
2. Cut away bad portions of hose and splice good lengths together.
3. Use soap suds to check torches and regulators for leaks at connections.
4. And always send defective apparatus to repair shop for inspection and repair.

Be your own Waste Warden! Each additional cubic foot of oxygen saved means additional oxygen for war production.

THE WASTE WARDEN

says:

DO close cylinder valve after use.
DO check your hose and connections for leaks.
DO keep your cylinder inventory low and return empties promptly.
DO keep tips clean and free from carbon and slag.

★ ★ ★

DON'T use excessive pressure.
DON'T use oversize tip.
DON'T leave torch burning when not in use.
DON'T abuse cylinders.

Air Reduction

General Offices:
60 EAST 42nd STREET, NEW YORK, N. Y.
IN TEXAS
MAGNOLIA-AIRCO GAS PRODUCTS CO.

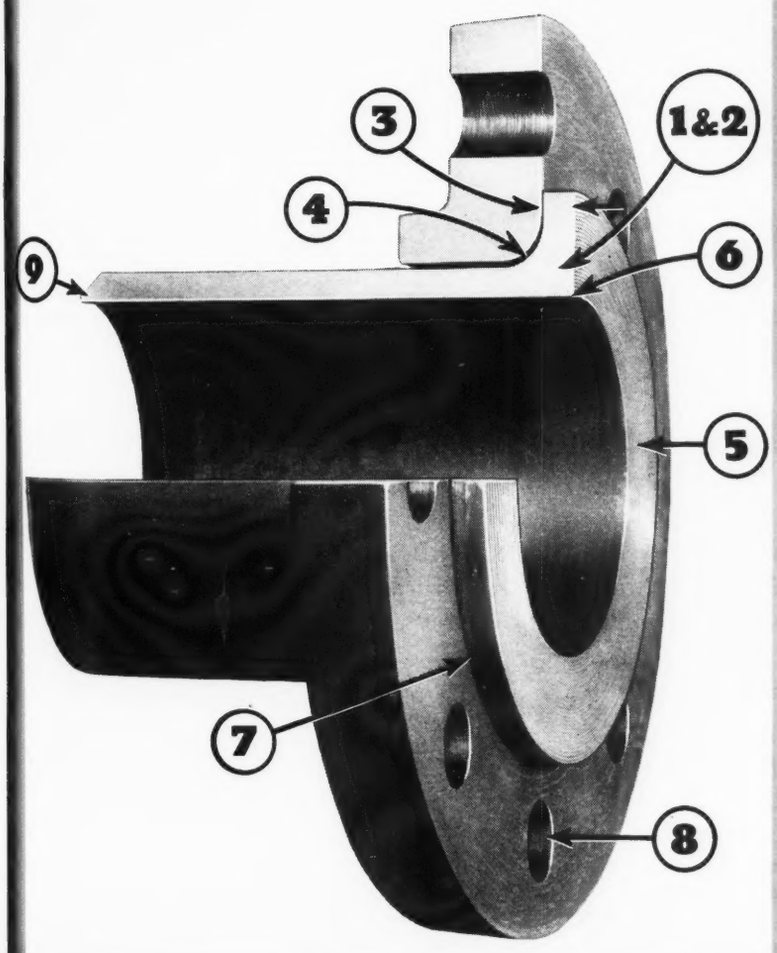
AIRCO

WILSON

OXYGEN IS PRODUCTION — *Don't Waste it!*

MIDWEST

LAP-JOINT STUB ENDS Have MANY ADVANTAGES



1. LAP IS FORGED—by a special Midwest process that simultaneously upsets the pipe and forms the lap. Tests have proved the superiority of this process.

2. STRESS RELIEVED—The metal in the lap is worked at a forging heat and then normalized to assure a uniform, close-grained structure. Photomicrographs show it frequently superior to the original pipe material.

3. HEAVY LAP—Thickness of finished lap (after machining front and back) is always at least equal to pipe wall thickness.

4. LARGE RADIUS FILLET—Assures more metal in the critical area of lap—where maximum total bending and shearing stresses occur. Advantages 3 and 4 are important factors in securing the greatest strength in the lap.

5. PHONOGRAPHIC FINISH—of lap face holds the gasket more securely.

6. SQUARE CORNER (instead of a round corner)—adds to lap strength but also eliminates pockets for accumulation of condensate and sediment that promote corrosion.

7. UNIFORM FLANGE BEARING—Back face of lap is carefully machined to assure the uniform flange bearing necessary to a satisfactory joint.

8. TIME SAVED—in both welding and erection because bolt holes need not be carefully lined up before welding.

9. MACHINE BEVELED—The other end of the Stub End is accurately machined for easy welding.

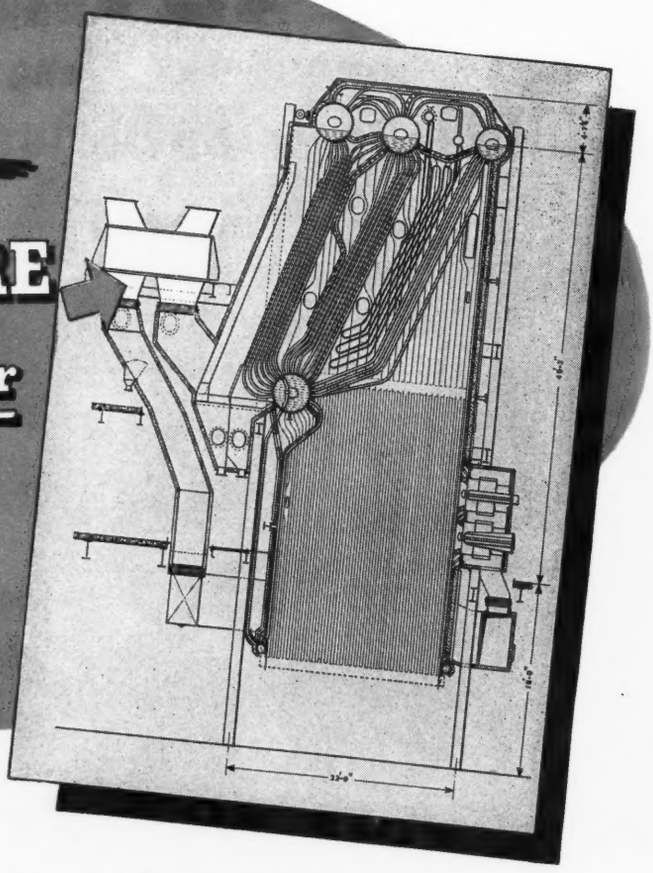
See Bulletin WF-41 for complete data on Midwest Lap-Joint Stub Ends . . . and the other Midwest Welding Fittings that simplify and save on welded piping.

MIDWEST PIPING & SUPPLY CO., Inc.

Main Office: 1450 So. Second St., St. Louis, Mo.
Plants: St. Louis, Passaic (N. J.) and Los Angeles
Sales Offices: Houston—229 Shell Bldg. • Tulsa—533 Mayo Bldg.
Chicago—949 Marquette Bldg. • Los Angeles—520 Anderson St.
New York (Eastern Division)—30 Church St.
San Francisco—535 Call Bldg.

MIDWEST WELDING FITTINGS SAVE TIME, IMPROVE THE DESIGN, AND REDUCE THE COST OF PIPING SYSTEMS

HEAT SAVED HERE
Means More Fire Power
At the Front



Ten new boilers like this at ordnance plants save fuel and steel with Ljungstrom Air Preheaters

Typical of the steam generating units being installed at a group of plants for munitions manufacture is this 135,000-lb.-per-hr. boiler, fired with powdered coal. Flue gases enter the Ljungstrom Air Preheater at 665 deg. F., leave at 351 deg., heating combustion air to 502 degrees.

. . . . .

Power plants that mean more fire power for American arms must go up fast, and then stay on the job without shut-downs. Yet conservation is as important here as elsewhere... every needless pound of steel must be spared, and every pound of fuel s-t-r-e-t-c-h-e-d by efficient combustion and maximum heat recovery.

For all these reasons, the uniform type of the steam generator chosen for this group of plants is equipped with the Ljungstrom Air Preheater.

The *continuous regenerative counterflow* principle of the Ljungstrom greatly reduces its size and weight, often saving one-half the steel that would otherwise be required for the same heat recovery. Erection is simplified, the preheater reaches the job as a completely fabricated unit. Further material savings are made in the supporting structure.

If you are faced with a problem of wartime power generation, or any need for gas-to-air heat transfer at temperatures to 1400 deg. F., be sure to check the *conservation features* of a Ljungstrom. A factual booklet, "Another Kind of Air Power with a Wartime Job to Do", tells the story. Write for a copy.

THE

AIR PREHEATER

CORPORATION

Executive Offices: 60 East 42nd Street, New York, N. Y. • Plant: Wellsville, New York

WeldELLS

have everything★

WIDEST RANGE
of types; sizes; thicknesses.
SEAMLESS
For greater strength
QUARTER-MARKED ENDS
Easier, more accurate fabrication.
6" STD. TAYLOR FORGE WELDELL PAT. 1936805
FULL WALL THICKNESS
Never less than specification minimum.
REINFORCED HERE
More metal where the stress is higher.
PERMANENT IDENTIFICATION
You can't go wrong on size and weight.
MACHINE TOOL BEVEL
Best welding surface. Accurate bevel and land.
TANGENTS
Keep weld away from highest stress zone; simplify lining up.

★Why settle for less?

WHAT do you seek in that welded piping job? Speed? Economy? Sound engineering to meet extreme conditions? What?

Of course any one of these considerations may slightly out-rank any other, depending on the nature of the installation. But the fact remains that every one of them is mighty important to *every* job.

That's why it pays to use the welding fittings that are designed down to the last detail to meet all requirements of every job. With features that are combined in no other welding fittings, WeldELLS give you the means of doing any job as *well* as it can be done—as *easily* as it can be done—and therefore as *economically* as it can be done.

A number of these features are pointed out above. Some provide engineering advantages; others reduce installation time and cut costs. Combined, they give you the extra value that distinguishes WeldELLS. Why accept less than the Welding Fittings that have *"everything"*?

TAYLOR FORGE & PIPE WORKS

General Offices & Works: Chicago, P.O. Box 485 • *New York Office:* 50 Church Street • *Philadelphia Office:* Broad Street Station Building

WANTED

By Victory Projects, Industries, Etc.

Good Used "Toledo" Geared Threaders and Cutters also Power Drives. Must be in Good Useable Condition. Stocks and Dies and Cutters from 4 inch on up.

Send us a letter giving Model Number, Serial Number and Price Wanted.

For Power Drives advise Serial Number and Motor Characteristics.

We will refer inquiries direct to you. You can make your own deal with interested party.

THE TOLEDO PIPE THREADING MACHINE CO.

TOLEDO, OHIO — **NEW YORK OFFICE, No. 2 RECTOR STREET**

"TOLEDO"

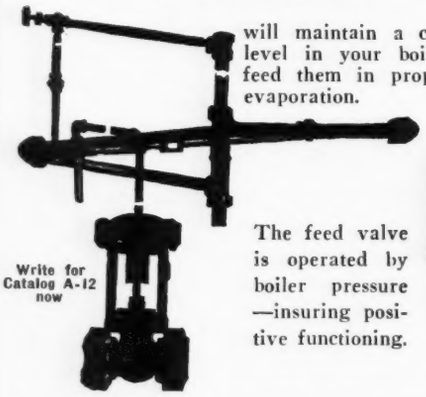
MAKERS OF FINE

PIPE TOOLS, POWER PIPE MACHINES, VISES, BENCHES

For Safe Boiler Operation

The Genuine Squires

Boiler Feed Water Controller



will maintain a constant water level in your boilers and will feed them in proportion to the evaporation.

Write for Catalog A-12 now

The feed valve is operated by boiler pressure —insuring positive functioning.

Trade Mark Reg. U. S. Patent Office

THE C. E. SQUIRES COMPANY

East 40th St. and Kelley Ave., Cleveland, Ohio

"WE'RE THANKFUL TODAY THAT WE SPECIFIED YESTERDAY"

JARECKI

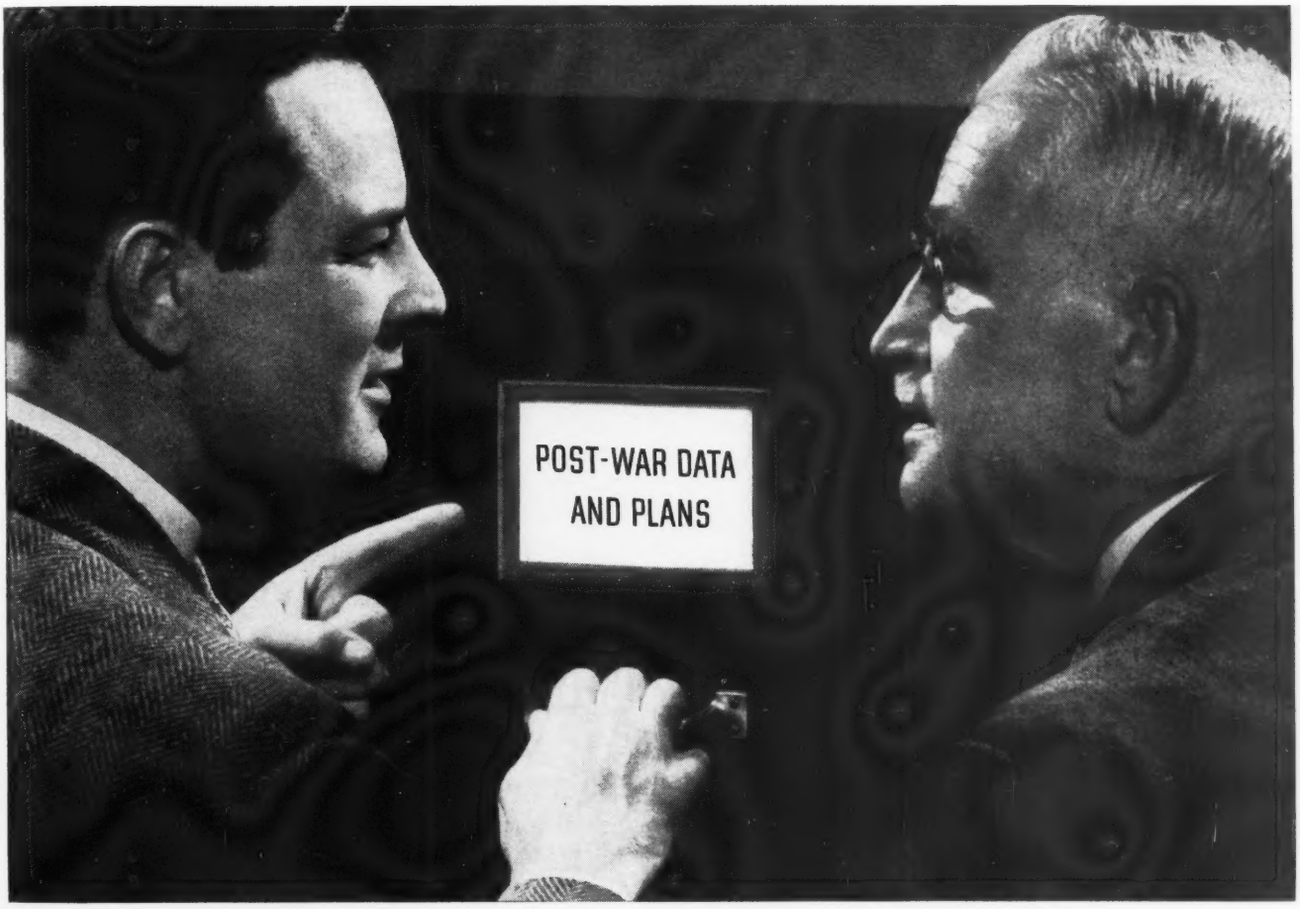
At a time of critical materials and priority restrictions, it's pleasant to know that valves installed before Pearl Harbor are still functioning perfectly, with every assurance that they will continue to serve through the duration. Jarecki customers are now drawing upon the RESERVE of service built into every valve bearing the Jarecki mark.

JARECKI MFG CO.

ERIE, PA., U. S. A.

THE MAN WITH A DRAWERFUL OF TOMORROW

[*A suggestion for the man who is helping to win the war today*]



"SORRY," said the Chief Engineer, "but I can't do a darn thing for you! Our latchstring is always open to a Taylor Field Man," he continued. "But our new plant is all finished and there won't be any more new construction for the duration!"

"That's exactly why I'm here!", I said. "I realize you fellows have the opportunity of a lifetime—and I want to help you all I can!"

"How do you mean?" asked the Chief.

"I mean now that you can't do any more building, you can do some real planning for *after* the war." And I went on to tell him about some of the new developments Taylor is working on for the power field. The new Taylor mercury-less manometer for metering steam flow is just one example of how Taylor Accuracy, in its all-out war effort, is inventing new instruments that will help America win the peace.

The Chief pointed to a filing cabinet. "We're way ahead of you!", he said. "Here's a drawerful of post-war ideas. There's a lot of Taylor material in here now. But give me everything else you think we can use. We want to *plan with Taylor in mind!*"

In their daily servicing of war industry, Taylor Field Engineers are amassing a wealth of experience that can help you in planning tomorrow—and in maintenance *right now!* Call your local Taylor office. Or write Taylor Instrument Companies, Rochester, N. Y. or Toronto, Canada. Instruments for indicating, recording and controlling temperature, pressure, humidity, flow and liquid level.

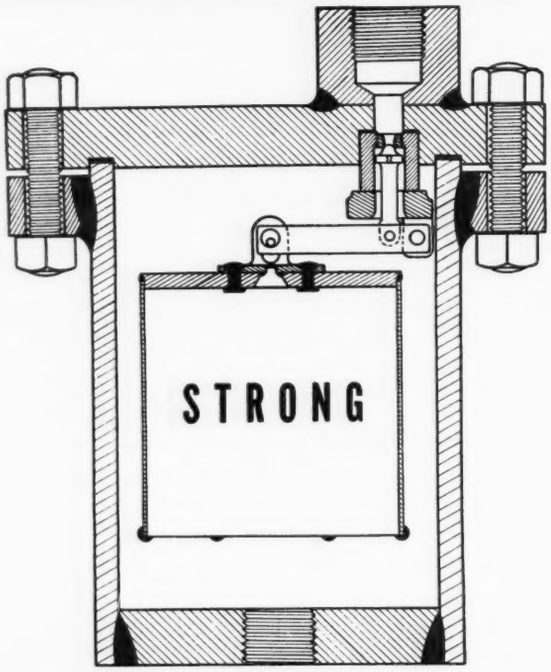
Taylor Instruments
MEAN
ACCURACY FIRST
IN HOME AND INDUSTRY

★ ★ ★ KEEP ON BUYING U. S. WAR SAVINGS BONDS AND STAMPS ★ ★ ★

PIPEWRENCH PETE SAYS:

New **WELDED Steel Trap for high pressures**

Certified Fabrication...Proved Design



Use WELDED *top quality* TRAPS for pressures to 600 lbs. (Temp. 750° F.)

You'll find these sturdy steel traps of proved design just right for high pressure, high temperature lines. STRONG certified operators and fabrication methods save manufacturing time and offer you striking economy without sacrificing rigid Strong quality.

WELDED (Series 90) TRAPS are constructed from seamless steel tubing—steel cover fastened with alloy steel bolts.

Such standard Strong features as—anti-balancing device, ANUM-METL valve-seat-pins, stainless steel bucket and lever. Internal bolted seat easily removed after years of service. *Write for information or call your Strong distributor.*

The Strong, Carlisle & Hammond Co.
1392 W. Third Street, Cleveland, Ohio

★ ★ ★ ★ ★ ★ ★ ★

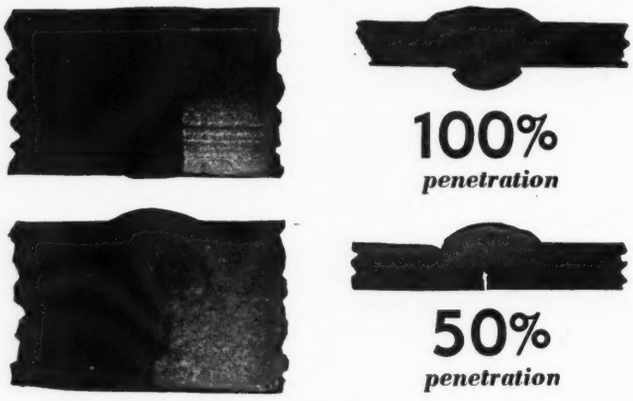
WAR—Strong Specialties are now needed for war plants (explosives, chemicals, aircraft, ships, etc.) **PLEASE CONSERVE** present Strong equipment. Use repair parts to restore efficiency . . . increase production . . . save steam (fuel) . . . save money.

14

STRONG
STEAM SPECIALTIES

USE WEDGE Split CHILL RINGS and WELD PIPE Faster and Better

The WEDGE Chill Ring with the patented SPLIT Feature has, in actual use, proven its efficiency for Power Plants. Its use will enable you to weld pipe FASTER and BETTER. The patented feature assures 100% PENETRATION and, therefore, a STRONGER joint. Consider it on your next job.



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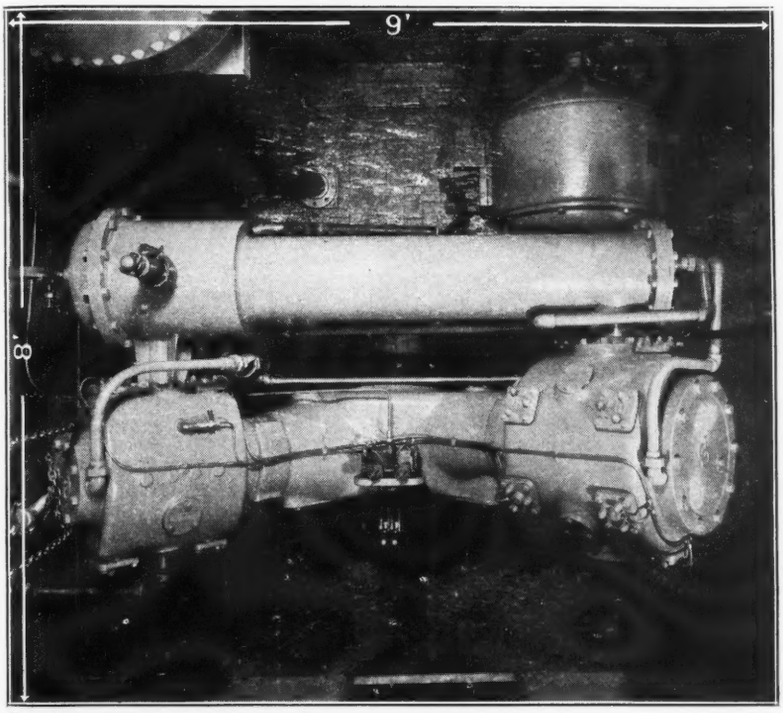

↑ PHOTOGRAPH TAKEN FROM ABOVE, shows CP Type Y Compressor with motor, aftercooler and receiver set up in a room only 8′ x 9′. Top of receiver is only 13′ from the floor. Shipped intact, quickly installed on an inexpensive foundation, CP Type Y Compressor solves the problem of the crowded plant that needs more air capacity.

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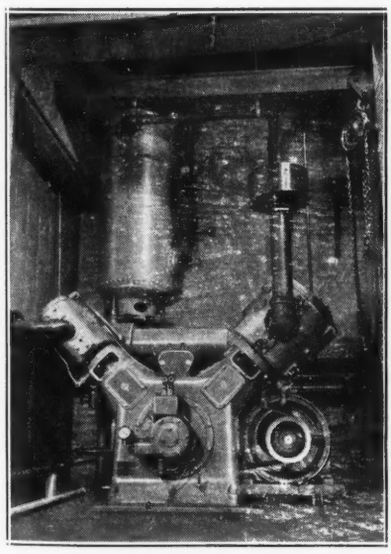

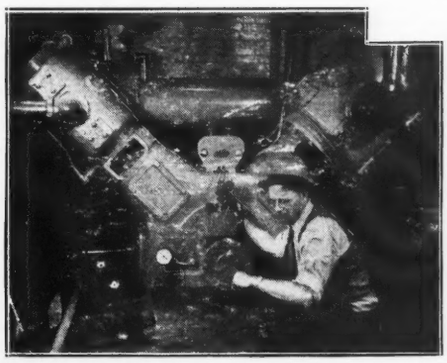

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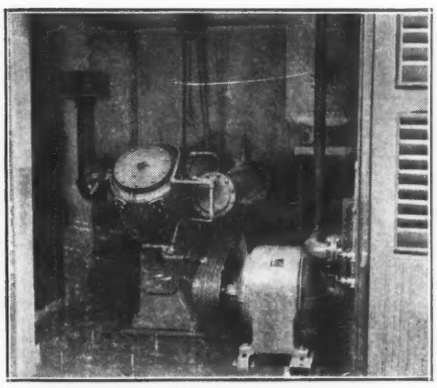

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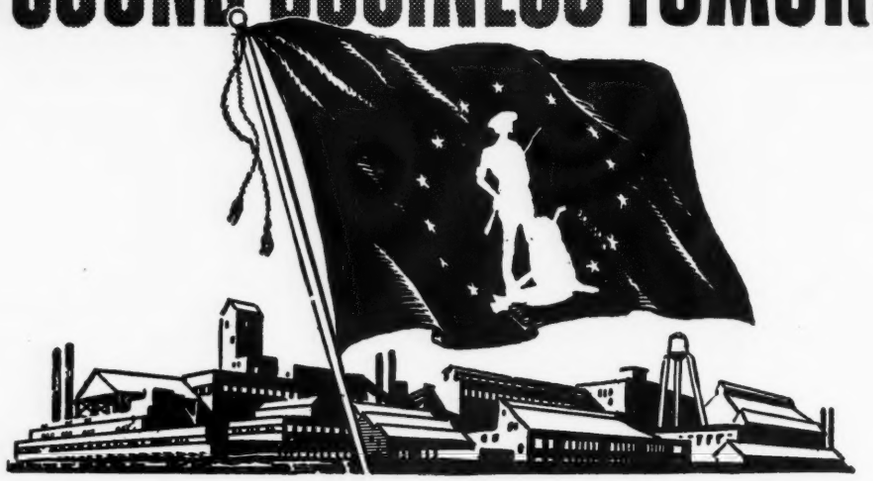

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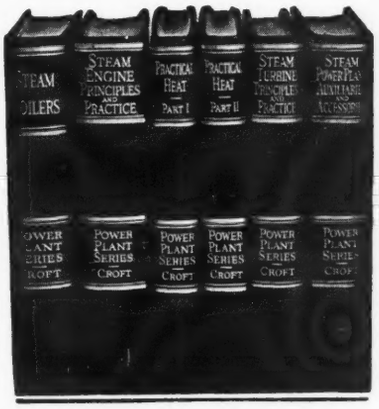
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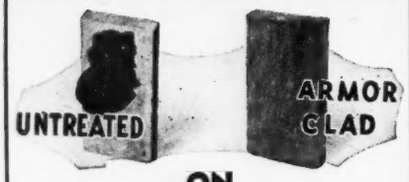

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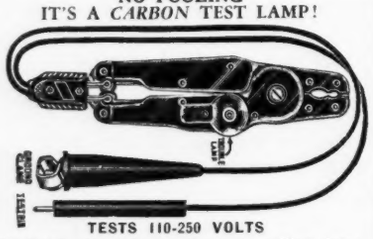

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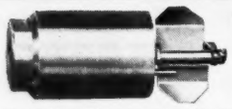

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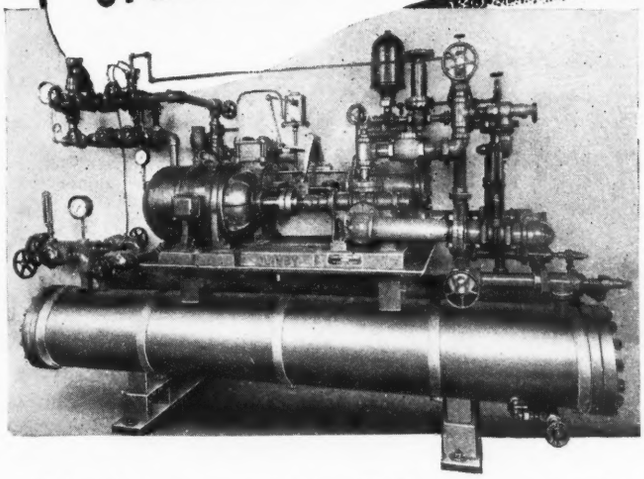

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No need to guess! If it's "Too Hot to Touch", it's wasting precious fuel, cutting power output and needlessly increasing costs! And that's near-treason today!

Check every pipe, valve, fitting, breeching, duct, etc. with the palm of your hand. Cover the "hot spots" with the right amount of the right form of Mineral Wool Insulation. Here's why:

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IN war or in peace, you and your fellow Americans require 1,465 lbs. (raw weight) of food every year. Soldiers require even more.

In all, for ourselves and our allies, America must produce, process and transport 250 billion pounds of food per year, for the duration, and for many years thereafter.

► Don't try to remember that figure, but *do* remember that food processing is a huge industry, in a high state of technical development, but not yet fully coordinated into the war effort.

The food industry needs over-all coordination, comparable to long-last rubber coordination. America needs an administrator of food supply; to assure priorities in equipment and transportation and to end conflicting and overlapping committee jurisdiction.

If the food supply gets into a tangle, through lack of a comprehensive plan, the result will make the rubber shortage seem a picnic in comparison.

► In the impending pandemonium, the Food Production Engineer will be strictly in the middle. He is neither a grower nor a global strategist, but a production man who must needs wait for government to call its shots on growing, equipment production and distribution.

The Food Production Engineer must see that the food is grown in proper quantities, at proper distances from his plant, and delivered in perfect condition . . . From that moment, he has all the problems of ordinary manufacturing, plus the job of contriving to retain the fleeting qualities of color, aroma, taste, texture and nutritive value which nature intended only for a few brief hours of ripeness.

That was tough to do, even in the days of unlimited refrigeration and canning. But under the urge of saving cargo space for men and munitions, new miracles have been worked.

Fortunately for us, in the continuous battle between bulk and low cubic content, the latter is winning.

Food Production Engineers—by developing machines and processes for trimming and compressing—have reduced whole sides of beef to a carton the size of a suit box.

► They have replaced sunken refrigerator ships by lining the holds of ordinary cargo vessels with boxes of frozen lard. Preserved by this Yankee "ice house" trick, frozen meats arrive overseas in perfect condition—while the lard goes to allied explosives plants for making TNT.

Eggs, stripped of their shells, travel through a fabulous array of processing machines, leaving space-taking water in America, but sending every ounce of energy-giving food value to our far-flung armies and allies.

When the Food Processor gets through with a basket of ripe tomatoes, you can hold the resulting cellophaned package in the palm of your hand . . . and only replaceable water has been lost.

► The work these men are doing will easily be the equivalent of launching a ship a day, as the processes which have been perfected are applied in more and more food plants.

If, under the constant pressure of tire, tin, and freight-car shortages, you find yourself sitting down to meals of dehyrated meats, fruits and vegetables, you can thank the Food Production Engineer for the fact that the tomato dishes will be ripe—red and delicious in taste, that soups are full-flavored and nourishing. That nothing has been lost but the water you have replaced.

•

Reprints of this advertisement are available in handy booklet form.

McGRAW-HILL PUBLISHING COMPANY, Inc.

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This advertisement appeared in a group of newspapers on Tuesday, October 13, 1942

How do you get the cube root of a cow?

READ the newspaper advertisement, reprinted opposite, and you'll see we are telling the public (and government) about the job engineers are doing in stuffing bigger food production into fewer ships.

When you get to that part of the ad that tells about Food Engineers reducing a cow's carcass to the size of a couple of suit boxes, you will have reached the point where McGraw-Hill really lives.

In Food Production, too, it's our job to collect the "how-to-do-it" news on each new advance in technology and equipment, and pass on this information to an entire industry.

The Industrial Press of America implements the exchange of ideas, which is a national characteristic and one of the secrets of our industrial development.

Through the interchange of ideas, made possible by the Industrial Press, the sum of American technical genius is greater than the sum of its parts.

If a food engineer in Illinois learns how to add and control Vitamin A in a food product, all food manufacturers learn how it was done, through a magazine like FOOD INDUSTRIES.*

If a manufacturer develops a new dehydrating machine, production men learn what it will do and how it operates, through the informative and helpful advertising that is characteristic of the Industrial Press.

No matter what your industry or your job, you can probably remember many instances where an industrial magazine has helped you find a solution to a production problem.

But valuable as they are, Industrial Magazines cost only a few dollars per year.

That's why the route slip is so puzzling. If a man needs to see a magazine at all, he should not be under pressure to pass it along.

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*FOOD INDUSTRIES—Shows how to Manage Production, Retain Nutrition and Appetite Appeal.
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(See also "Selling Opportunity Offered")

LARGE casualty insurance company requires several graduate or practical mechanical or electrical engineers. Insurance experience unnecessary. State education, experience, age and salary required. P-318, Power 330 W. 42nd St., New York, N. Y.

SEVERAL ENGINEERS, supervisors or foremen familiar with safety activities in mass production plants for large insurance company. Send full details, age, experience, etc. P-319, Power, 330 W. 42nd St., New York, N. Y.

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TURBINE AND SWITCHBOARD Operator for industrial plant located in the South. Must be experienced in operation of General Electric Extraction Type Turbines, Switchboard and Auxiliary Equipment. In replying give full details. Address P-317, Power, 330 W. 42nd St., New York, N. Y.

LARGE INDUSTRIAL COMPANY operating own power plant in Waterbury, Connecticut, is seeking night power plant supervisor. Must be United States citizen, preferably between 35 and 40 years of age, with suitable experience in public utility, or large industrial plant, on electrical generation, steam and air units. Write P-308, Power, 330 W. 42nd St., New York, N. Y.

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PROFITABLE SMALL EQUIPMENT side line now available for bituminous coal and stoker salesmen. Commission. Give details of territory covered. SW-321, Power 330 W. 42nd St., New York, N. Y.

FOR SALE

ANDERSON 120 H.P. diesel slow speed direct connected to 90 KVA Generator with belted exciter. Excellent condition. Geo. C. Nixon, 7939 W. Lafayette Blvd., Detroit, Michigan.

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FOR SALE

FOR SALE
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30 KW Buda Diesel, A.C. Generating Set with all accessories; in good condition.

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BLOWER

Sturdevant, Blower, design 3 Size 8 #16824 Practically new

Est. of Geo. I. Treyz
Cooks Falls, N. Y.

EQUIPMENT FOR SALE—See Pages 280-296
WANTED—See Page 296

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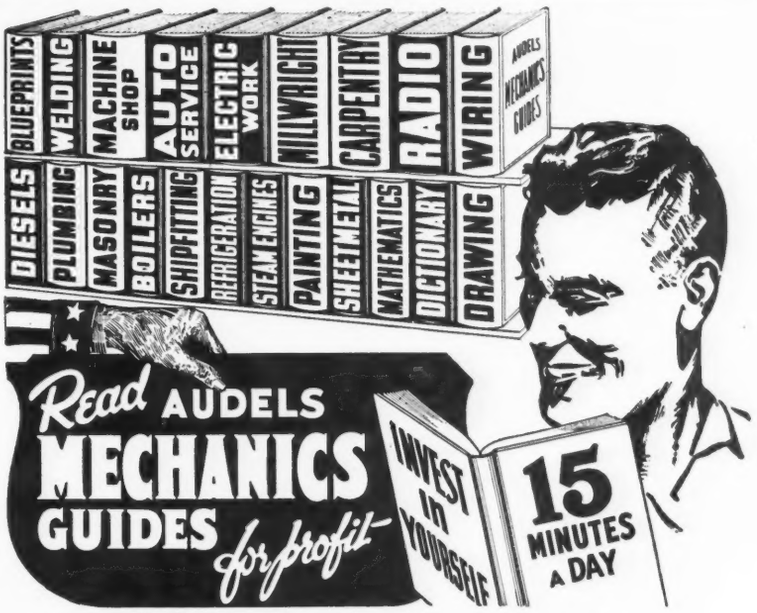

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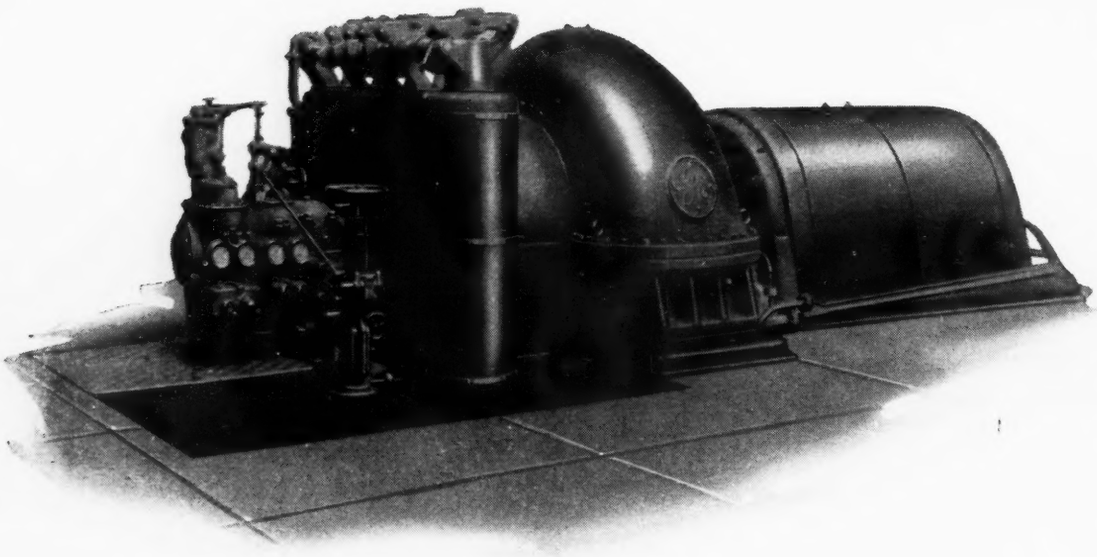

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3125 KVA GENERAL ELECTRIC CONDENSING TURBO UNIT

3125 KVA General Electric Alternating current generator, 3 phase 60 cycle 2400/4160 volts 3600 RPM direct connected to General Electric condensing turbine 225-400 lbs. steam pressure 700 deg. TT. Equipped with surface condenser and auxiliaries.

ALTERNATING CURRENT TURBO GENERATORS

3 Phase 60 Cycle

6250 KVA GENERAL ELECTRIC condensing 200-225 lbs. pressure, 100 deg. superheat, 3600 RPM with jet condenser; 2300 volts.

3125 KVA GENERAL ELECTRIC condensing 225-400 lbs. pressure, 700 deg. TT, 3600 RPM with surface condenser; 2300/4160 volts.

1250 KVA ALLIS CHALMERS condensing, 150-200 lbs. pressure, 100 deg. superheat, 3600 RPM with jet condenser; 2300 volts.

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1540 sq. ft. WORTHINGTON surface condenser with steam jet air pumps.

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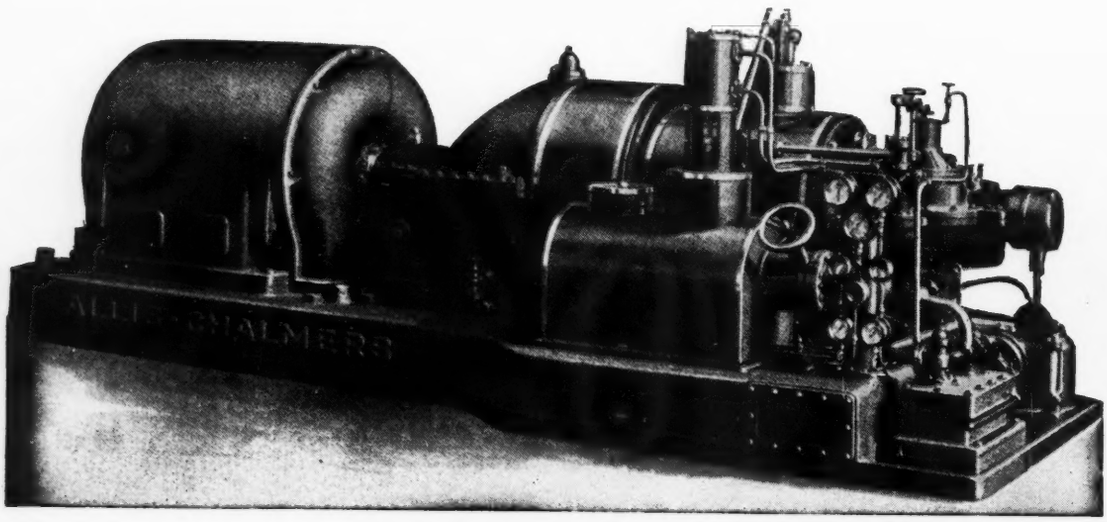
510 KVA GENERAL ELECTRIC-WORTHINGTON full diesel, 200 RPM, 2300 volts.

300 KVA FAIRBANKS MORSE full diesel, 257 RPM, 2300 volts.



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1250 KVA ALLIS CHALMERS CONDENSING TURBO UNIT

1250 KVA Allis Chalmers alternating current generator 3 phase 60 cycle 2300 volts 3600 RPM direct connected to Allis Chalmers condensing turbine 150-200 lbs. steam pressure 100 deg. superheat. Equipped with jet condenser and auxiliaries.

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125/250 Volts 3-Wire

150 KW CROCKER WHEELER—Ames 3 cylinder vertical Uniflow, 200-250 lbs. 0.8 lbs. back pressure, 360 RPM.

125 KW CROCKER WHEELER—Ames 3 cylinder vertical Uniflow, 200-250 lbs. 0.8 lbs. back pressure, 360 RPM.

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210 KVA GENERAL ELECTRIC, 2300/600/480/240 volts, 225 RPM.

THE NATIONAL POWER M

ER EQUIPMENT

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3500 KW (2) WESTINGHOUSE, 225-285 volts D.C., 225 RPM with 3 phase 60 cycle 13200 volt transformers.

2500 KW WESTINGHOUSE, 600 volts D.C., 400 RPM with 3 phase 60 cycle 11000 volt transformers.

1500 KW WESTINGHOUSE, 225-285 volts D.C., 450 RPM with 3 phase 60 cycle 2300/4000-6900/12000 volt transformers.

1250 KW GENERAL ELECTRIC, 250 volts D.C., 720 RPM with 3 phase 60 cycle 2300 volt transformer.

750 KW GENERAL ELECTRIC, 600 volts D.C., 1200 RPM with 3 phase 60 cycle 2300/4000 volt transformers.

500 KW (2) WESTINGHOUSE, 600 volts D.C., 1200 RPM with 3 phase 60 cycle 6600-445/222 volt transformers.

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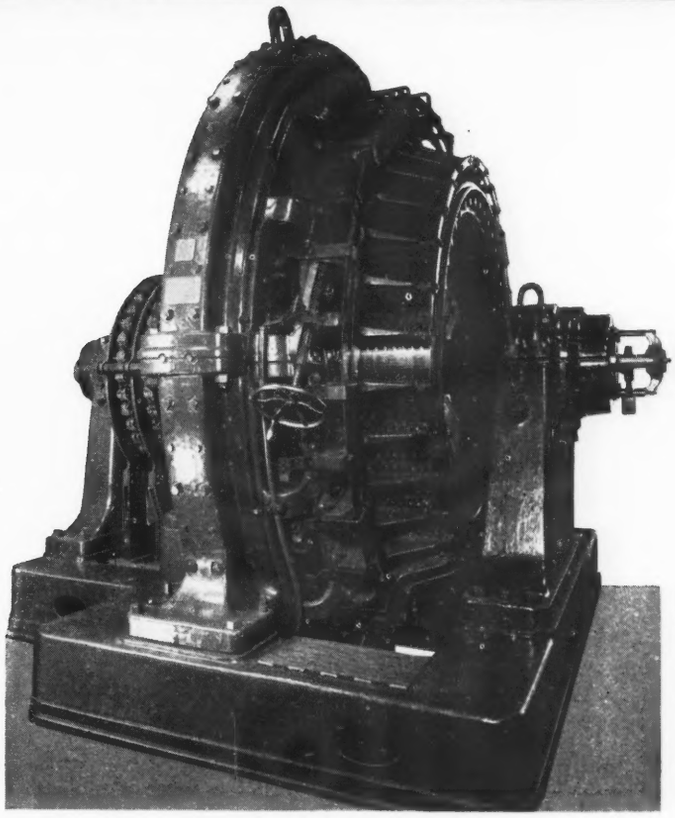
1500 KW WESTINGHOUSE, 600 volts D.C., 500 RPM with 3 phase 25 cycle 11000 volt transformer.

3500 KW (2) Westinghouse booster type interpole, rotary converters, 225-285 volts D.C. 225 RPM; 6 phase 60 cycle A.C. with 3 phase 60 cycle 13,200 volt transformers. Complete with control.



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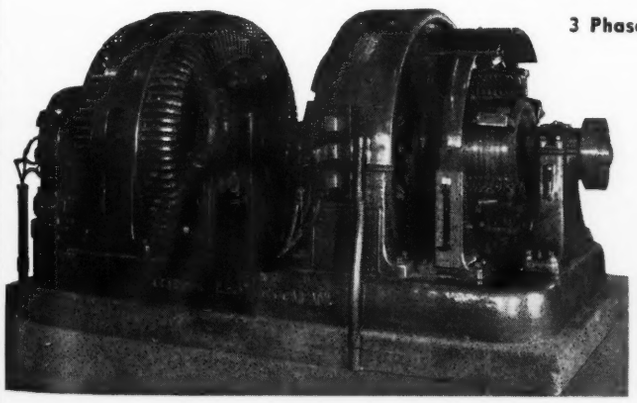
3500 KW WESTINGHOUSE ROTARY CONVERTER

MOTOR GENERATOR SETS

3 Phase 60 Cycle



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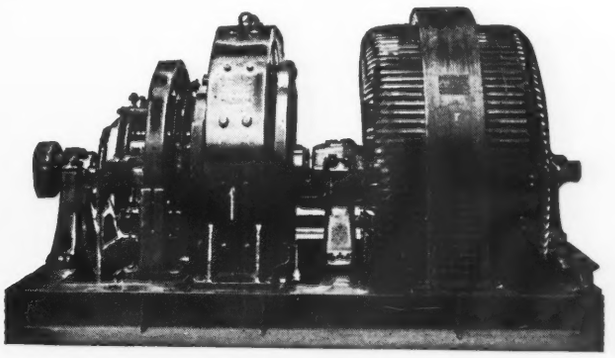
750 KW GENERAL ELECTRIC MOTOR GENERATOR SET

750 KW GENERAL ELECTRIC direct current generator, 600 volts 720 RPM direct connected to 1100 HP 80% P.F. General Electric synchronous motor 3 phase 60 cycle 2300 volts 720 RPM. Equipped with D.C. control panel and starting equipment.



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1000 KW GENERAL ELECTRIC MOTOR GENERATOR SET

1000 KW GENERAL ELECTRIC direct current generator, 125/250 volts 3-wire 720 RPM direct connected to 1400 HP 80% P.F. General Electric synchronous motor 3 phase 60 cycle 13200/6600 volts 720 RPM. Equipped with D.C. breakers.

500 KW WESTINGHOUSE direct current generator, 125-250 volts 3-wire, 720 RPM direct connected to 720 HP Westinghouse synchronous motor 3 phase 60 cycle 6600/4000/2300 volts 720 RPM. Equipped with D.C. control panel and starting equipment.

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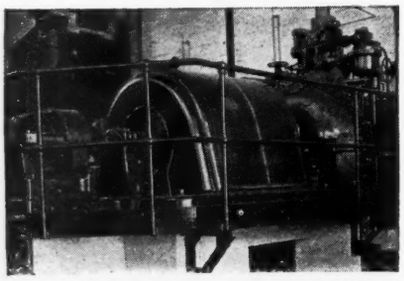


MOTOR GENERATOR SETS

2—200 KW, 250 volt, Electric Machinery, syn.
1—50 KW, 250 volt, General Electric, sq. cg.
1—35 KW, 125 volt, El. Mach., sq. cg.
1—20 KW, 600 volt, G.E. sq. cg.
1—15 KW, 250 volt, GE, sq. cg.

D. C. GENERATORS

1—75 KW, 675 RPM, 125 volt, Westinghouse.
1—75 KW, 260 RPM, 250 volt, Westinghouse.
1—75 KW, 675 RPM, 125 volt, Westinghouse.

MOTORS—3 PHASE 60 CYCLE

1—720 HP, 360 RPM, 440 volt, G.E., syn.
1—500 HP, 1200 RPM, 440 volt, GE, syn.
1—500 HP, 450 RPM, 2200/4000 volt, G.E., slip ring.
1—400 HP, 514 RPM, 440 volt, Westg., slip ring.
1—350 HP, 100 RPM, 220/440 volt, G.E. syn.
1—335 HP, 600 RPM, 2300 volt, G.E. syn.
1—300 HP, 720 RPM, 2200 volt, G.E., Sl Rg.
1—250 HP, 514 RPM, 4000 volt, G.E., syn.
1—250 HP, 600 RPM, 4000 volt, G.E. Sync.
1—200 HP, 900 RPM, 440 volt, Westg., sl. rg.
1—200 HP, 600 RPM, 2200 volt, G.E., sl. rg.
1—200 HP, 450 RPM 2200/4000 v., G.E., sl. rg.
1—150 HP, 1800 RPM, 2300 volt, Allis Chal. sq. cg.
1—150 HP, 1800 RPM, 440 volt, West. Sq. Cg.
1—150 HP, 900 RPM, 440 volt, Allis Chal. sl. rg.
1—150 HP, 720 RPM, 440 volt, G.E., slip ring.
1—150 HP, 600 RPM, 440 volt, G.E., slip ring.
1—150 HP, 400 RPM, 440 volt, G.E., sq. cg.
2—125 HP, 720 RPM, 440 volt, G.E., slip ring.
2—125 HP, 450 RPM, 440 volt, G.E., syn.
1—100 HP, 900 RPM, 440 volt, G.E., slip ring.
3—100 HP, 720 RPM, 440 volt, G.E., slip ring.
1—100 HP, 720 RPM, 440 volt, G.E., sq. cg.
1—100 HP, 600 RPM, 440 volt, G. E., slip ring.
1—100 HP, 600 RPM, 440 volt, G.E., sq. cg.
1—100 HP, 514 RPM., 440 volt G.E. sq. cg.
2—100 HP, 450 RPM, 440 volt, G.E., sq. cg.

MOTORS—D. C. 230 VOLTS

1—250 HP, 760 RPM, Electro Dynamic.
1—100 HP, G.E. 575 RPM
1—100 P, 625 RPM, G.E.
1—150 HP, 750 RPM, Electro Dynamic.
1—125 HP, 600 RPM, Westinghouse, SK.
1—65 HP, 1000 RPM, G.E., type RC.
1—50 HP, 750 RPM, Westinghouse, type SK.
1—50 HP, 700 RPM, Crocker Wheeler.
50 HP, 750 RPM, G. E. CO1829
1—40 HP, 1100 RPM, G.E., type RC.
1—40 HP, 300 RPM, General Electric
1—30 HP, 750 RPM, G.E., type RC.

MOTORS—VARIABLE SPEED 230 VOLTS

2—100 HP, 475/1375 RPM, Electro Dynamic
1—90 HP, 470/940 RPM, General Electric.
1—75 HP, 525/1575 RPM, Electro Dynamic.
1—60 HP, 600/1200 RPM, General Electric.
1—35 HP, 500/1500 RPM, Westinghouse.
1—35 HP, 350/1050 RPM, Electro Dynamic.
1—30 HP, 225/900 RPM, Crocker Wheeler.
2—25 HP, 300/900 RPM, Electro Dynamic.
1—20 HP, 750/1500 RPM, General Electric.
1—15 HP, 300/1200 RPM, GE.
1—5 HP, 600/1200 RPM, General Electric.
6—5 HP, 400/1200 RPM, Westinghouse.
1—5 HP, 225/900 RPM, Electro Dynamic.

ALTERNATORS

1—625 KVA, 450 RPM, 600 volt, Westg.
1—625 KVA, 3600 RPM, 600 volt, G.E.
1—400 KVA, 400 RPM, 240 volt, Westg.
1—375 KVA, 200 RPM, 240 volt, Elec. Mach.
1—250 KVA, 720 RPM, 230 volt, G.E.
1—200 KVA, 3600 RPM, 240 volt, Allis Chal.
1—37½ KVA, 1200 RPM, 2400 volt, Westg.

TURBO-GENERATORS

2—1000 KW, 3 ph., 60 cy., 2300/4150 v., cond.
1—500 KW, G.E., 3 ph., 60 cy., 480 volt, bleeder.
1—375 KVA, Westinghouse, non-condensing.
1—300 KW, G.E., 3 ph., 60 cy., 220 v. cond.
1—200 KW, G.E., 3 ph., 60 cy., 220 volt, cond.

TRANSFORMERS

2—400 KVA, G.E., 4156-240/480 v., Scott taps.
3—300 KVA, Pittsburgh, 7800/440 volts.
1—200 KVA, Pittsburgh, 7800-110/220 volts.
3—150 KVA, G.E., 33,000-2300/4000 Y.
3—150 KVA, Pittsburgh, 6600/440 volts.
4—150 KVA, G.E., 3 ph., 4150-120/208 v.
3—125 KVA, General Electric, 2300/480.
3—100 KVA, Westinghouse, 13200 250 volts.
1—75 KVA, Pittsburgh, 7600-110/220 volts.
3—50 KVA, Wagner, 4150-220 volts.
4—50 KVA, Westg., air cooled, 440-220/220-110 v.
3—50 KVA, Westinghouse, 220-110/220 volts.
3—50 KVA, G. E., 2200-110/220 volts.
52—37½ KVA., 2200-220/110 v.
10—25 KVA, Westg., air cooled, 440/220-110 v.
3—25 KVA, Moloney, 2200-220/110 volts.
1—25 KVA, GE., 220/110-220/110 volts.
2—15 KVA, G.E., 2300-115/-230 volts.
1—15 KVA G.E., 440/110-220 volts.
4—10 KVA G.E., 2300-115/230 volts.
3—7½ KVA, G.E., 440-110/220 volts.

OIL CIRCUIT BREAKERS

1—3000 amp., 15,000 v., 3 pole, G.E., type FK-130.
1—3000 amp., 600 v., 4 pole G.E. type FK-24
1—1600 amp. 7500 v., 4 pole Westg., B-2.
1—1200 amp., 15000 v., 4 pole, Westg., B-2.
Also complete stock of small sizes.

15,000 KVA Transformers for National Defense

IT'S "HEMPHILL" for POWER EQUIPMENT

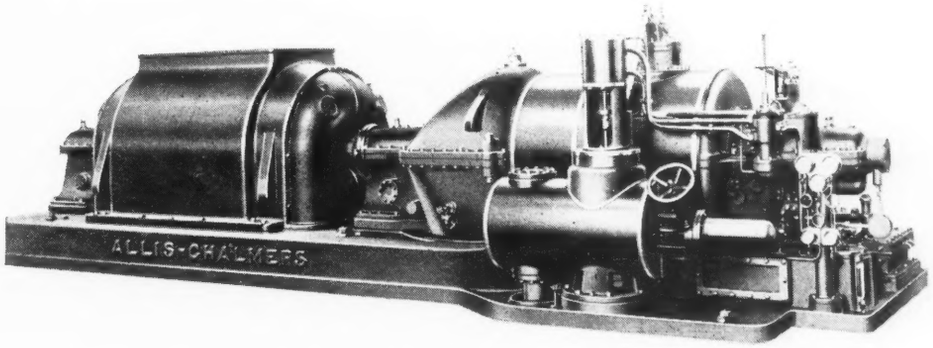
J. L. HEMPHILL & CO. PHONES { NEW YORK: LOngacre 5-3227 / NEW JERSEY: UNion 3-2600

1602 53rd STREET, NORTH BERGEN, N. J.

DEPENDABLE

Turbo-Generators

It is the Practice of this Company to Confine its Inventory Strictly to Comparatively Modern, Little Used Turbines Some Are Practically New



2—Allis-Chalmers, 2500-KVA, 3/60/2300-volt, 200#-P, 500°F-TT, Surface Condensers

PART OF OUR INVENTORY—BELOW

1—Westinghouse 6250-KVA, 3/60/2300-v, 200# 500°F. TT. Surface Condenser.

1—Allis-Chalmers 4000-KVA, 3/60/2300-v, 200#, 500°-F, TT, Condensing.

1—G.E., 2500-KVA, 3/60/600-v, 200# 500° F. TT. Condensing.

1—G.E., 1563-KVA, 3/60/2300-v, 175#, 100° SH, 28". Surface Condenser.

1—Westinghouse, 1563 KVA, 3/60/2400 volts, 200#, 100° SH. Condensing, Modern.

1—Westinghouse 1250 KVA, 250-volt, Direct Current, Condensing, 150/200# pressure. Surface Condenser.

1—Allis-Chalmers 1250-KVA, 3/60/2300-v, 200#, 500° TT. Surface Condenser.

1—G.E., 1250-KVA, 3/60/480-v, 175#-P and 16# Abso. Mixed Pressure.

1—G.E., 937-KVA, 3/60/2300-v, 200#, 500°-TT, 3-Stage Condensing.

1—Allis-Chalmers, 937-KVA, 3/60/2300-v, 200#, 500°-TT, Condensing Surface Condenser.

1—G.E., 625-KVA, 3/60/2300-v, 200# 500° TT. Condensing.

1—G.E., 625-KVA, 3/60/600-v, 250#, 550°F-TT, Condensing Modern.

WILMS, WEAVER & CO. Penobscot Building DETROIT, MICH.

We Deal in Turbo-Generators Exclusively

THE PICK OF POWER EQUIPMENT

TURBO UNITS—60 Cy.
1—12000 KW General Electric Cond.
1— 6250 KVA General Electric Cond.
1— 4000 KVA Allis Chalmers Cond.
1— 3125 KVA General Electric Cond.
1— 2850 KVA Westinghouse Cond.
1— 1250 KVA General Electric Cond.
1— 937 KVA General Electric Cond.
1— 750 KVA General Electric Cond.
1— 750 KVA Terry Double Extr. Cond.
1— 375 KVA General Electric Cond.
1— 250 KVA General Electric Cond.
1— 938 KVA West. 375# I.P. 100# B.P. N-C
1— 937 KVA Moore-Allis N-C. Bleeder
1— 375 KVA General Electric Non-C.
1— 312 KVA Moore Non-Condensing
1— 200 KW Elliott Non-Condensing
1— 187 KVA Westinghouse Non-C.
1— 125 KVA Westinghouse Non-C.

STEAM ENGINE UNITS—60 Cy.
1—1067 KVA Nordberg Uniflow
2— 937 KVA Nordberg Uniflow
1— 500 KVA Rice & Sargent Corliss
1— 325 KVA Skinner Uniflow
1— 300 KVA Hamilton 4-valve
1— 250 KVA Harrisburg Uniflow
1— 150 KVA Hamilton Poppet Valve

DC STEAM ENGINE UNITS
1—500 KW Skinner Uniflow 250 V.
1—350 KW Ridgway 4-valve 250 V.
1—300 KW Skinner Uniflow 250 V.
1—300 KW Erie City 4-valve 250 V.
1—200 KW Chuse 4-valve 250 V.
1—150 KW Erie Ball 4-valve 250 V.
1—150 KW Ames Uniflow 125 V.
1—100 KW Ames Uniflow 120 V.
1—100 KW Elliott 4-valve 250 V. 3-wire
1— 75 KW Skinner Uniflow 250 V.
1— 50 KW Ames Uniflow 125/250 V. 3-wire

OIL & GAS ENGINE UNITS—60 Cy.
1—1000 KVA Cooper (gas) 240 V.
1— 400 KW West. (gas) 440 V.
1— 375 KVA Fair.-Morse 2300 V.
1— 75 KVA Fair.-Morse 2300 V.
1— 40 KVA Fair.-Morse 2300 V.

WATER TUBE BOILERS
4—750 HP Edge Moor 200-lb.
2—633 HP Bigelow Hornsby 225-lb.
6—600 HP Stirling 180-lb. Stokers
2—520 HP Heine 200-lb. Hand Fired
1—512 HP Stirling 200-lb. Stoker
2—490 HP Stirling 200-lb.
1—400 HP Stirling 200-lb.
1—400 HP B. & W. 160-lb. Stoker
2—357 HP Casey-Hedges 175-lb. Stokers
2—350 HP Stirling 200-lb.
2—302 HP B. & W. 200-lb. Hand Fired
1—300 HP Kingsford 160-lb. Pulverized Coal
2—282 HP Edge Moor 200-lb. Stokers

SYNCHRONOUS MOTORS—60 Cy.
2—800 HP Electric Machy. 6600 V. 450 RPM
1—200 HP General Electric 2200 V. 1800 RPM
1—175 HP General Electric 230 V. 225 RPM
1—150 HP General Electric 440 V. 164 RPM
1—100 HP General Electric 4000 V. 900 RPM
1—100 HP General Electric 2300 V. 240 RPM

INDUCTION MOTORS—60 Cy.
2—800 HP G. E. slip ring 2300 V. 300 RPM
2—400 HP G. E. slip ring 3800 V. 1800 RPM
2—300 HP G. E. sq. cage 440 v. 600 RPM
2—250 HP G. E. sq. cage 4000 V. 1200 RPM
1—250 HP G. E. slip ring 2200 v. 450 RPM
5—150 HP West. sq. cage 440 V. 900 RPM

AIR COMPRESSORS
1—2100 Ft. 65-lb. Worth. 60 cy. motor
1—1300 Ft. 100-lb. Sullivan Diesel
1—1200 Ft. 100-lb. Ing. 2-stage, belt driven
1—1052 Ft. 100-lb. Ing. XRE, 60 cy. motor

OIL CIRCUIT BREAKERS
1— 800 A. 87 KV Am.Br.Bov. AF22 Outdoor
2— 600 A. 73 KV West. G222AS Outdoor
1— 400 A. 73 KV G. E. FKO36 Outdoor
2— 600 A. 37 KV Condit FO40A Outdoor
1— 400 A. 37 KV G. E. FKO36-7AS Outdoor
4— 400 A. 34.5 KV Condit D-16-A Outdoor
2—1000 A. 30 KV Kelman CB-76 Outdoor
1— 400 A. 25 KV G. E. FKO136 Outdoor
2— 600 A. 15 KV Kelman CB-76 Outdoor
1— 400 A. 15 KV G. E. FKO37 Outdoor
6—1200 A. 7.5 KV G. E. FK-132-B Indoor
2— 600 A. 7.5 KV G. E. FK-132-B Indoor

FREQUENCY CHANGERS
2—3125 KVA West. 25/62½ cy. 750 RPM
1—3000 KVA G. E. 60/25 cy. 300 RPM
1—2500 KVA West. 25/60 cy. 300 RPM
1—1500 KW G. E. 25/60 cy. 300 RPM
1—1250 KVA G. E. 25/62½ cy. 375 RPM
1—1000 KVA G. E. 60/25 cy. 514 RPM
1— 750 KVA G. E. 25/60 cy. 300 RPM

ROTARY CONVERTERS—60 Cy.
1—1500 KW Westinghouse 250 V.
1—1250 KW General Electric, 240 V.
2—1000 KW General Electric, 600 V.
2—1000 KW Westinghouse, 250 V.
2— 500 KW General Electric, 250 V.
1— 500 KW General Electric, 600 V.
2— 300 KW General Electric, 600 V.

SYNCHRONOUS CONDENSERS
1—4000 KVA G. E. 13200 V. 514 RPM
1—2000 KVA G. E. 11000/2200 V. 720 RPM
1—2000 KVA C. W. 11000 V. 600 RPM
1—1000 KVA G. E. 2300 V. 900 RPM
1— 500 KVA West. 2200 V. 900 RPM

TRANSFORMERS—1 Ph. 60 Cy.
3— 600 KVA West. 120,000/2300 V.
1— 5000 KVA Allis 72000/6660 V. 3 ph.
3— 500 KVA West. 66000/2400 V.
3— 500 KVA Allis 33000/480 V.
1—10000 KVA G. E. 26400Y/2300 V. 3 ph.
2— 1000 KVA G. E. 23000-11500/575 V.
3— 250 KVA G. E. 22000/11000 V.
3— 100 KVA Allis 2200/440 V.
1—10000 KVA Pitts. 13200/460 V. 3 ph.
2— 5000 KVA American 13800/2300 V.
1— 450 KVA G. E. 13200/240-480 V. 3 ph.
3— 200 KVA G. E. 13200/2300-4000 V.
3— 150 KVA Pitts. 13800/230-460 V.
3—1000 KVA Packard 11000/2300-4000 V.
3— 150 KVA Pitts. 11000/2400 V.
3— 100 KVA West. 11000/250-125 V.
3—1250 KVA G. E. 6600/550 V.
3— 100 KVA G. E. 6900/440-220 V.
3— 833 KVA Penn. 4800/120-240 V.
3—1000 KVA Pitts. 2300-4600/550 V.
4— 150 KVA G. E. 2300/115-230 V.
6— 50 KVA G. E. 2400/240-120 V.

PARTIAL LIST—WE HAVE ALL CLASSES OF POWER EQUIPMENT

BREW, WOLTMAN & Co., INC.
50 CHURCH STREET, NEW YORK CITY

SUCCESSFUL OPERATION GUARANTEED

Every Machine in This Ad is Owned Outright By Us

D C MOTORS

230 Volt—Constant Speed

	HP	Make	Type	Speed
2—	625	G.E.	MPC	130
1—	250	Al. Ch.		525
2—	200	Whse.	SK	400
1—	200	G.E.	DMC	475
1—	150	G.E.	MPC	275
1—	140	G.E.	MDS-108	410
1—	125	G.E.	CDP-123	1750
1—	300	G.E.	MPC	250/400

230 Volt—Adjustable Speed

1—	600	Whse.		150/275
1—	300	G.E.	MPC	275/550
1—	200	Whse.		400/500
1—	150	G.E.	MPC	250/450
3—	150	Whse.	SK-201	300/900
1—	100	Al. Ch.		950/1150

DC MOTORS—Special

	HP	Make	Type	Volts	Speed
1—	1500	Whse.	Interpole	550	330
3—	1250	G.E.	MPC	500	130
1—	270	Whse.	Interpole	500	250/400
3—	130	Cr. Wh.	50H	500	1200

TRANSFORMERS

	KVA	Make	PH	Type	Voltages
1—	1500	Whse.	3	OISC	26400/13200x460
3—	1000	G.E.	1	HKDD	13800x2300
3—	300	G.E.	1	H	13200x2300/575
2—	200	Whse.	1	SK	6900x230/460
3—	200	G.E.	1	H	26400x115/460
3—	100	Whse.	1	OISC	13200x250

SYN. CONDENSER

1—4000 Kva. G.E. 2 units 3 Brg Condenser set with exciter consisting of Cond. 4000 Kva., 13200 volt, 3 ph. 60 cy. with 1150 HP, 13200 v. motor and 100 KW Exciter.

MOTOR GENERATOR SETS

3 ph. 60 cycle

1—1500 KW GE 600 V. DC, Gen. d.c. to 2100 HP—6600 V. Syn. Motor with exciter.
1—500 KW GE 600 V. DC Gen. d.c. to 700 HP—13200 V. Syn. Motor with Exciter.
1—500 KW Whse., 250 V. DC Gen. d.c. to 700 HP—2300/6600 V. Syn. Motor with Exciter.

TURBO GENERATOR SET

1—500 KW, Whse. 625 Kva., 440 V., 3 ph., 60 cy., 3600 RPM with Parsons 145/175 lb. condensing turbine complete with jet condenser and accessories.
1—500 KW, G.E., 625 KVA, 2300 v., 3 ph., 60 cy. generator with Curtis 4 stage, 150 pound condensing turbine complete with condenser, etc.

ROTARY CONVERTERS

60 Cycle

2—1500 KW, Whse. 720 RPM 650 v. DC with 3-single phase, 23000 v. transformers and panel.
1—750 KW Whse. 720 RPM 250 v. DC with three phase 6600/2300 v. transformer and panels.
1—300 KW, G.E., type HCC, 1200 RPM., D.C., 600 V AC, 6 ph., 1200 RPM

25 Cycle

2—1500 KW GE 225/275 v. DC Booster type each with 1600 KVA, 3 ph. 6765 volt transformers and panels.
1—500 KW GE 225/275 DC Booster type with 500 Kva 3 ph. 6765 volt transformer and panels.

GEAR UNITS

1—2100 HP Whse., 1800/375 RPM
1—943 HP GE 5306/1200 RPM
1—720 HP De Laval 3600/600 RPM

A C MOTORS

3 phase—60 cycles

Synchronous

	HP	MAKE	Type	Volts	Speed
1—	500	G.E.	TS	440	360
1—	300	G.E.	ATI	440	600
1—	250	G.E.	ATI	220	450
1—	200	Whse.		440	514
3—	150	G.E.	TRB	220x440	450
1—	150	Whse.		2200/550	1800
1—	125	G.E.	ATI	240	257

Slip Ring

1—	600	G.E.	IM	2200	900
1—	450	Whse.	CW	2200	875
1—	400	G.E.	MT	550/440	300
1—	400	Al. Ch.		2300	505
1—	300	G.E.	IM	2300	585
1—	250	G.E.	MT-410	2300	400
1—	250	G.E.	MT	4000/2300	257
2—	200	Whse.	CW	2200	514

Squirrel Cage

1—	500	G.E.	1-17B	2200	695
1—	300	Whse.	CS	550	580
2—	300	G.E.	IK	2300	600
1—	300	Al. Ch.		2200	1160
1—	250	Al. Ch.		220/440	1150

SINE WAVE SET

Main unit—GE 3 unit, 4 Brg. consisting of motor—15/35 HP, 750/1800 RPM, 230 V. DC Gen—15 KW—220/110 V., 1800 RPM—3 ph., 60 cy.

Ref. Gen—5 KW—36/18 V., 1800 RPM, 3 ph., 60 cy., with stator shifting.

Complete with Exciter Set, Voltage regulator, panels and accessories.

RE-NU BILT BELYEA MOTORS

What are your requirements? units up to 5000 kw available in stock.

BELYEA COMPANY INC.
Main Office & Shop: 43 HOWELL ST., JERSEY CITY, N. J.

1892 — 1942

PAUL STEWART and COMPANY

HEAVY POWER-PLANT EQUIPMENT

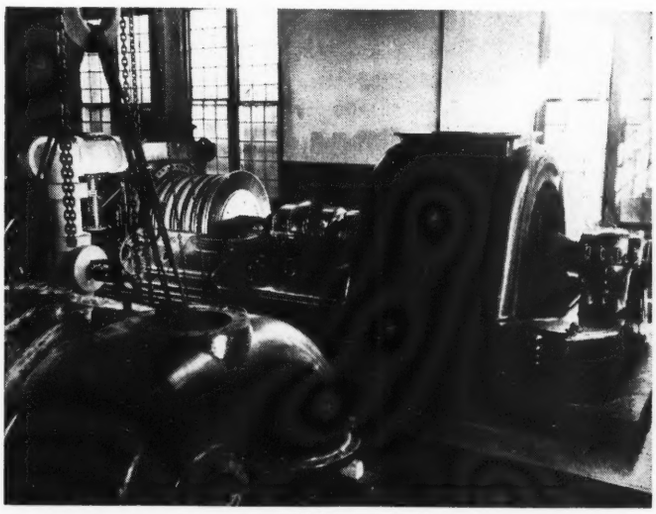
CINCINNATI

7500 KW Condensing Turbo-Alternator

—10,000 KW ACTUAL CAPACITY—

(SURFACE CONDENSER)

General Electrical Company • 60/3/1800/5000 Volt/200#/100° S H



Rebladed and reconditioned
Subsequent Log record: 200 Hours

•

Steel steam chest and throttle Valve—
Generator full mica insulated

•

Constant overload capacity: 40% @ 80% P.F.
Operation on 250 Steam.

•

C. H. Wheeler Surface Condenser and auxiliaries Westinghouse transformer 10,000KVA 5000/12,500V.

2000 KW	GE Bleeder	20# Abs. B.P. 30,000#/hour 1800 KW 60/3/1800/2300V; 150-200#/100°SH) Surface Condenser equipped
2000 KW	Allis 60/3/440	Log Record: 8000 Hours
2000 KW	Allis 60/3/2300	short Log Record

2500 KW 200/250# 600° TT 60/3/2300 Surface Cond. No Switchboard

A FEW FINE SMALLER UNITS (Checked and Inspected)

For 125/200# . . . Condensing or Non-Condensing (15/20# abs. b.p.) . . in the Range of 300/1200 KW . . . 440/2400 Volts . . .

WATER TUBE BOILERS

4—450 HP	200# B&W Straight Tube	Chain Grate Stokers	(In Canada)
4—500 HP	200# B&W Sectional Hdr	Chain Grate Stokers	(Middleswest)
1—800 HP	AND 1 570 HP 180#	Erie City Vertical	(Great Lakes)
2—350 HP	AND 1 400 HP 180#	B&W Stirling	(Great Lakes)

FOR FIFTY YEARS, HEAVY POWER SPECIALISTS

POWER PLANT EQUIPMENT CO., INC.

39 Cortlandt Street
New York, N. Y.

AC TURBINE UNITS

6250 KVA G.E. 2300 V. cond.
4000 KVA Al. Chal. cond.
3125 KVA G.E. 2300 V. cond.
2500 KVA G.E. 2300 V. cond.
1875 KVA Al. Chal. 2300 V. cond.
1250 KVA (2) G.E. 2300/4000 V. cond.
937 KVA G.E. 2300/600 V., Non-Cond.
937 KVA G.E. 2300 V., 550° cond.
937 KVA Al. Chal.-Kerr 480/240 V. Non-cond.
937 KVA Al. Chal.—Elliott, 480/240 V., cond. or mixed pressure; with Jet Condenser, etc.
780 KVA Al. Chal. 2300 V., with Surface Condenser, Radio-Air Ejectors, etc. NEW, never in service.
625 KVA Wghse, 2300 V.
625 KVA Al. Chal. 2 ph., 2400 V.
625 KVA G.E. 2300 V.; Bleeder; Condensor.
625 KVA Al. Chal.-Kerr 240/480 V. Non-Cond.
625 KVA Al. Chal.—Elliott, 240/480 V., Automatic Bleeder, with Jet or Surface Condensor.
625 KVA Wghse. 2400 V.
375 KVA G.E. 2300 V., non-cond.
375 KVA Al. Chal. 2 ph., 2400 V.
375 KVA G.E. 2300 V., Bleeder.
312 KVA Ridgeway-Elliot 480/240 V., with Jet Condensor. Condensing or Mixed Pressure.
150 KVA Wghse. 240/480 V.
75 KVA Al. Chal. 240-440 V. non-cond.

BLEEDER TURBINE UNIT

625 KVA Allis Chalmers-Elliott 3 ph. 60 cy. 240/480 v.; automatic bleeder; with jet or surface condensor

AC ENGINE UNITS

375 KVA G.E. 22x27 Erie Ball 4 V.
250 KVA G.E. 17x20 Erie Ball 4 V.
320 KVA Al. Chal.-Nordberg Uniflow.
225 KVA G.E.—18x36 Hamilton Corliss.
225 KVA G.E. 15x24 Nordberg Uniflow.
187 KVA G.E. —18x21 Chuse Uniflow.
150 KVA (2) G.E.—16x16 Skinner Uniflow.
125 KVA G.E. 14x15 Skinner Uniflow.
112 KVA G.E. 14x18 Erie Ball 4 V.
100 KVA G.E. 14x16 Skinner Uniflow.

BOILERS (ASME)

650 HP Babcock & Wilcox 225#
500 HP Murray (Heine) 200#
420 HP Sterling, 200#
320 HP Sterling, 200#
302 HP Babcock & Wilcox, 200#
295 HP (3) Sterling, 200#
270 HP (2) Erie City bent tube, low head. 180 lbs. with pulverizers. (A complete plant.)
253 HP (2) Heine, 160#—cross drum.

GAS & DIESEL UNITS

1000 KVA G.E. 3 ph. 60 cy.; with Cooper Bessemer Nat. Gas. Engine.
375 KVA Wghse. 3 ph. 60 cy.; Busch-Sulzer.
219 KVA G.E. 3 ph., 60 cy. Worthington
200 KVA G.E. 3 ph. 60 cy.; Busch-Sulzer.

ENGINE (Steam)

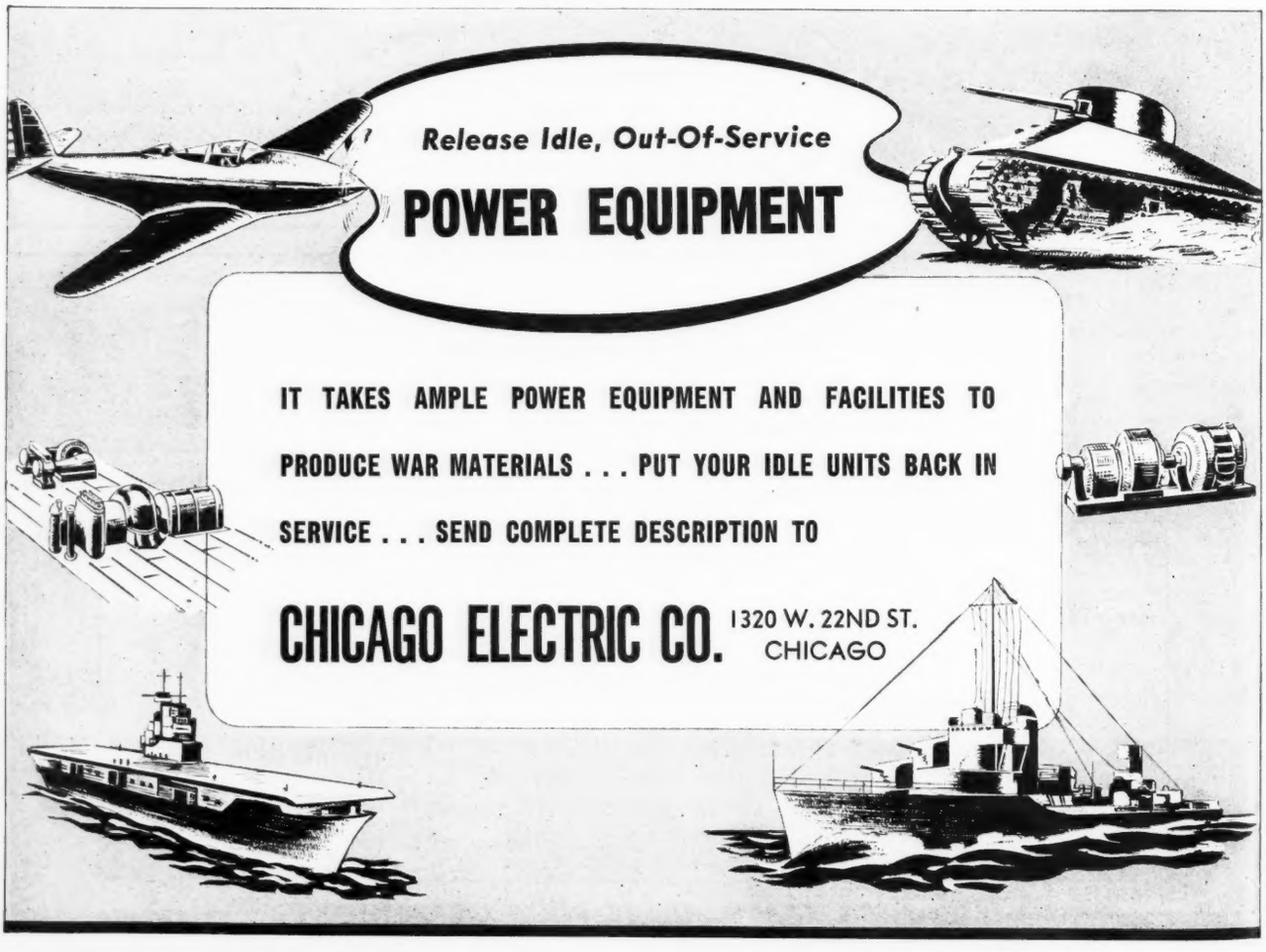
20x21 Skinner Uniflow, belted, 175 lbs. (15 to 25 lbs. b.p.)

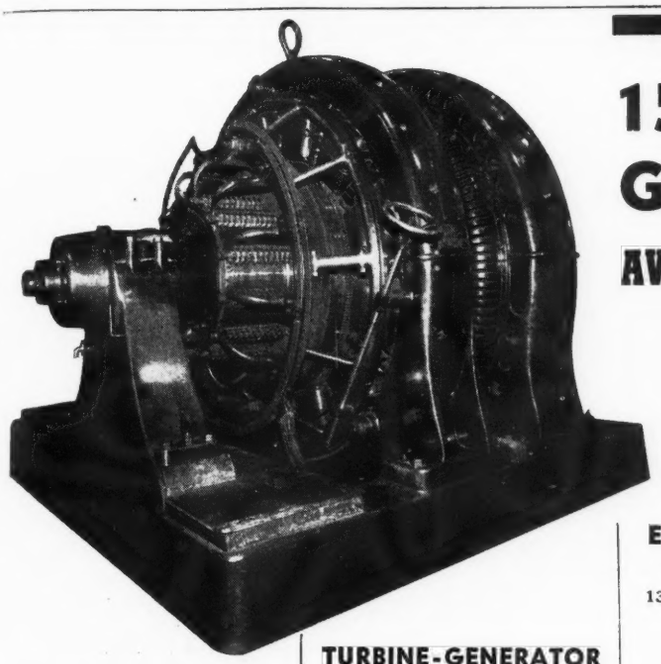
OIL HEATING & PUMPING UNIT

Suitable for 1000 HP to 2500 HP in Boilers

TRANSFORMERS

5—1800 KVA G.E. 3 ph. 14,520-600 V.
1—1250 KVA G.E. 3 ph. 13,200/26,400-2300 V.
3—833 KVA Wghse. 22000-2200 V.
2—687 KVA Maloney 13,800/460 V.
2—500 KVA Maloney 2200/220 V.
3—500 KVA Wghse. 22000-2200 V.
3—333 KVA G.E. 11,000/440 V.
3—300 KVA Maloney 17,500-440 V.
1—300 KVA Maloney 3 ph. 13,200/6600-220/440 V.
6—300 KVA Pittsburgh 22,000-2200/440 V.
2—250 KVA G.E. 6600/5940-2300 V.
3—250 KVA Packard 22,000-2200 V.
3—200 KVA Pitts. 25,000-460 V.
4—200 KVA Wghse. 13,200-2300/4000 V.
3—200 KVA G.E. 22,000-2200/6600 V.
1—200 KVA G.E. 13,200-2300/4000 V.
5—200 KVA G.E. 13,200/26,400-2300 V.
5—200 KVA Wghse 2200-110/220 V.
3—150 KVA Wghse. 11,000/440 V.
3—150 KVA G.E. 13,200-115/230 V.
1—150 KVA Wagner 13,860-110/220 V.
1—150 KVA G.E. 13,800-230/460 V.
3—100 KVA G.E. 13,200/2300 V.
3—100 KVA Al. Chal. 22,000/440 V.
3—100 KVA G.E. 13,200/6600/2300 V.
3—100 G.E. 13,200/460-2300/4000 V.
2—100 KVA G.E. 13,800-115/230 V.
1—100 KVA G.E. 33000-2300/4000 V.
2—100 KVA G.E. 600-120/240 V.
2—100 KVA G.E. 6600/13,200/11,880-440-605 V.
1—100 KVA Wagner 13,860/220/110 V.
3—75 KVA Wghse. 11,000/440 V.
3—75 KVA G.E. 13,200-115/230 V.
4—50 KVA Wghse. 2200-220/440 V.
3—37½ KVA Wghse. 2300/575 V.


Release Idle, Out-Of-Service
POWER EQUIPMENT
IT TAKES AMPLE POWER EQUIPMENT AND FACILITIES TO PRODUCE WAR MATERIALS . . . PUT YOUR IDLE UNITS BACK IN SERVICE . . . SEND COMPLETE DESCRIPTION TO
CHICAGO ELECTRIC CO.
1320 W. 22ND ST.
CHICAGO



1500 KW MOTOR GENERATOR SET

AVAILABLE IMMEDIATE DELIVERY

1—ALLIS CHALMERS Motor Generator Set consisting of:
1500 KW, 600 Volt Direct Current Generator Direct Connected to a 2190 HP, 3 Phase, 60 Cycle, 4000/6600 Volts, 300 RPM Synchronous Motor.

TURBINE-GENERATOR UNITS

3 phase 60 cycle

6250 KVA Westinghouse condensing 175-200 lb. pressure, 2300 volts, complete with surface condenser and auxiliaries.

1563 KVA G.E. condensing 175-200 lb. pressure 500° T.T., 2300 volts, 3600 RPM, complete with surface condenser and condensing auxiliaries.

1250 KVA ALLIS condensing 150-200 lb. pressure, 100° superheat, 2300 volts, 3600 RPM, complete with Wheeler surface condenser.

937 KVA G.E. condensing 200 lb. pressure, 100° SH, 2300 volts, 3600 RPM complete with condenser, exciter, switchboard and instruments.

937 KVA Westinghouse automatic extraction condensing, 150-200 lb. pressure, 10 lb. bleeder, 480 volts, 3600 RPM, complete with direct connected exciter and switchboard.

937 KVA Allis condensing 200 lb. pressure, 100° superheat, 2300/550/480 volts, 3600 RPM complete with direct connected exciter, and either with a surface or jet condenser. Modern.

937 KVA ALLIS condensing 150 to 200 lb. pressure, 475° TT, 2300 volts, 3600 RPM, complete with direct connected exciter, surface condenser and auxiliaries.

750 KVA G.E. condensing, 150-200 lb. pressure, 2300 volts, 3600 RPM, complete surface condenser and exciter set.

625 KVA G.E. condensing 200 lb. pressure, 2300 volts, 3600 RPM, complete with condenser and auxiliaries.

TURBINE-GENERATOR UNITS (Con't.)

375 KVA G.E. condensing 150-200 lb. pressure, 100° superheat, 2300 volts, 3600 RPM, complete with surface condenser auxiliaries.

375 KVA (2) G.E. non-condensing 175 lb. pressure, 6 lb. back pressure, 2300 volts, 3600 RPM each complete with direct connected exciter and switchboard.

125 KVA General Electric non-condensing, 150 lb. pressure, 10 lb. gauge back pressure, 240 volts, 3600 RPM, complete direct connected exciter and switchboard.

ENGINE-GENERATOR UNITS

3 phase, 60 cycle—Alternating Current

1000 KVA G.E. 480 volts, 150 RPM direct connected 31" x36" Skinner Unaflow engine, complete exciter, switchboard panel and instruments.

500 KVA G.E., 240/480 volts, 150 RPM direct connected 26"x32" Skinner, Universal Unaflow non-condensing engine, 130-160 lb., 6 lb. back pressure, complete exciter and rheostats.

438 KVA General Electric 2300 volts, 200 RPM alternating current generator direct connected to Busch Sulzer *vertical full Diesel engine.*

312 KVA Elliott 4000/2300/550 or 240 volts, 180 RPM direct connected to 17" x 24" Elliott Unaflow non-condensing engine, 175 lb. pressure, 6 lb. gauge back pressure.

210 KVA Westinghouse, 480 volt, 257 RPM alternating current generator direct connected to Winton vertical Diesel oil engine.

ENGINE-GENERATOR UNITS (Con't.)

135 KVA General Electric 2300 volts, 277 RPM alternating current generator direct connected to Busch Sulzer *vertical full Diesel engine.*

ENGINE-GENERATOR UNITS

Direct Current

600 KW Crocker-Wheeler 250 volts, 300 RPM direct connected to a 14" x 18", 4 cylinder Ames vertical Unaflow non-condensing engine, 150 to 175 lb. pressure, 5 lb. gauge back pressure complete switchboard and instruments.

300 KW WESTINGHOUSE 250 volts, 175 RPM direct connected 24"x26" Skinner Unaflow non-condensing engine, 110-150 lb. pressure, 5 lb. back pressure, complete switchboard and instruments.

50 KW General Electric, 125 volts, 1200 RPM direct connected 75 HP Terry non-condensing turbine, 150 lb. pressure, 15 lb. back pressure, complete with switchboard.

MOTORS

3 phase, 60 cycles

875 HP, WESTGH. 440 V., 240 RPM synchronous.

700 HP Allis 440 volts, 360 RPM slip ring complete with control equipment.

625 HP G.E., type ATI, 2200 volts, 257 RPM synchronous.

620 HP G.E. type ATI, form S, 440 volt, 164 RPM synchronous.

600 HP Allis 2200 volts, 600 RPM two-bearing slip ring with control.

500 HP General Electric, type MT, 2300 volts, 450 RPM, three-bearing slip ring with control.

300 HP, 80% P.F. WESTINGHOUSE 2300 V., 200 RPM synchronous.

150 HP (2) G.E. 440 volts, 1800 RPM squirrel cage.

125 HP, (3) 80% P.F. Elec. Mchy. 440 v., 440 RPM synchronous with starting equipment.

MOTORS (Con't.)

50 HP, type 1, form M, 3 phase, 60 cycle, 2200 volts, 1200 RPM slip ring.

50 HP Allis-Chalmers, 440 volts, 600 RPM squirrel cage.

MISCELLANEOUS

1500 KVA, 3 phase, 60 cycle, 22,000 volt primary, 2300 volt secondary WESTINGHOUSE transformer.

500 KVA IDEAL, 3 phase, 60 cycle, 240 volts, 400 RPM, three-bearing belted type generator with direct connected exciter and rheostats.

312 KVA WESTINGHOUSE, 3 phase, 60 cycle, 2300 or 220 volts, 200 RPM, engine type generator with belt driven exciter and rheostats.

300 KVA General Electric, 3 phase, 60 cycle, 440 volt, 600 RPM, three bearing belted generator complete with switchboard.

200 KVA WESTINGHOUSE, 3 phase, 60 cycle, 240 volts, 200 RPM engine type generator with rheostat.

1 ELLIOTT EHRHART jet condenser with all auxiliaries suitable for operation with a 5000 KW turbine-generator unit.

1055 cubic feet, 100 lb. air pressure CHICAGO PNEUMATIC horizontal compressor direct connected to 170 HP, 240 V., 150 RPM General Electric direct current motor.

SPECIAL

1 PRACTICALLY NEW WESTINGHOUSE FREQUENCY CHANGER SET CONSISTING OF: 655 HP, 3 phase, 25 cycle, 2200 volts, 300 RPM synchronous motor direct connected to 565 KVA 80% P.F., 3 phase, 60 cycle, 240 volt, alternating current generator complete and equipped with direct connected exciters, all panels with instruments.

Utilities Electrical Machinery Corporation

600 NATIONAL CITY BANK BLDG.
CLEVELAND, OHIO

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LONG DISTANCE 422

USED MACHINERY DEALER HELPS WIN WAR . . .

by keeping his eyes peeled . . . his ears to the ground . . . to detect and procure idle Machinery for War Work. Not an easy job in itself, yet he doesn't stop there. He burns telegraph and telephone lines to find idle machinery . . . then with his facilities rebuilds this Machinery so that it can be put to work promptly.

O'BRIEN OF PHILADELPHIA KNOWS HOW!!

That briefly is what we have been doing since the outbreak of the War *and for more than a quarter century before it.* Our entire organization and facilities are hard at work securing, rebuilding, and placing machinery for vital war needs. Finding employment for idle machinery for vital war needs. Finding employment for idle machinery on hand puts Victory into production faster than building new machinery. Because it contributes to Victory, it's a job of which we're proud.

As a result of our 27 years experience we now have on hand, not yet allocated, some very desireable MACHINE TOOLS and EQUIPMENT for the STEAM & ELECTRICAL POWER PLANT waiting to aid the war effort.

★ PARTIAL LISTING OF ITEMS IN STOCK, SUBJECT TO PRIOR SALE ★

AIR COMPRESSORS

1050 CFM Chicago Pneumatic type OCB, Size 19 x 12 x 14 with 150 HP, 2200 volt motor.
503 CFM Ingersoll-Rand 14 x 10 ER 60# Belted.
386 CFM Ingersoll-Rand 12 x 12 ER 115# Belted.
368 CFM Ingersoll-Rand 12 x 10 ER 100# Belted.
360 CFM Chicago Pneumatic 12 x 7 x 10 NCTB 100# Belted.
245 CFM Worthington 10 x 9 75# Belted.
140 CFM Gardner 8 x 6 Duplex 125# Belted.
136 CFM Gardner Denver 8 x 8 x 8 125# Steam Drive.
92 CFM Ingersoll-Rand 7 x 7 x 6 FR 100# Steam Drive.

ENGINE AND TURBINE GENERATOR SETS

1—1500 KVA West. 3/60/2300/3600 RPM, cond., all accessories.
1—2500 KW G.E., 3/60/2300/3600 RPM, cond. all accessories.
1—3200 KW Al. Ch. 3/60/2300/3600 RPM, cond. all accessories.
1—500 KW Westinghouse Turbo Generator, 3 phase, 60 cycle, 2300 volt, 900 RPM, with direct connected Exciter, connected through Westinghouse Herringbone Gears to 500 KW West. type EHNC, Non-Condensing Steam Turbine, 6000 RPM, No. 8686, with Switchboard. Phila. Stock.
1—250 KW G.E., ATB, 3/60/2300/440/220, 200 RPM; direct connected 20" x 24" Ridgeway-Chuse Uniflow, non-cond.

MOTOR GENERATOR SETS

1—500 KW West. 250 v. D.C., 714 HP Syn. Motor 3/60/4100/900 RPM. ser. 4,000,000. A.C., D.C. Panels.
1—400 KW Gen. Elec. 3-wire, 135/270 volt; 575 HP Synchronous, 3/60/4000 volt, 3-unit
2—55 KW West. 260 volt, D.C., 75 HP West. sq. cage Mtr., 3/60/220/900 RPM.
1—35 KW Fairbanks Morse 250 volt D.C., with 60 HP F.M. Syn. Mtr., 3/60/220/1200 RPM.
2—25 KW Gen. Elec. type CD-85, 250 volt D.C., with 40 HP G.E., type KT, 3/60/220/1800 RPM.

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THE O'BRIEN MACHINERY CO.

"PHILADELPHIA'S LARGEST DEALERS IN MACHINERY AND EQUIPMENT"

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MOTORS • GENERATORS • TRANSFORMERS

Prices on Application

3 PHASE, 60 CYCLE, 220/440 V.

HP	Make	RPM	Type	Frame
5	West.	1200	CCL	2 phase
5	American	600	totally enc.	ball bearing
7½	Gen. Elect.	1800	KT	944
7½	Gen. Elect.	1800	KQ	944 2 phase
10	FairbanksMorse	900	KBY	
10	CrockerWheeler	900	Nema	365
10	Burke	1800		
15	Reliance	1200		2 phase
15	Howell	900		2 phase
20	Gen. Elect.	1800	KQ501	2 phase
20	Gen. Elect.	565	I	Form K
25	Gen. Elect.	1740	KQ312	2 phase
25	Armor	1200	ball bearing	2 phase
25	Gen. Elect.	1800	KT	312
30	Gen. Elect.	3600	KT	513
30	Armor	695	ball bearing	2 phase
50	West.	1200	MS	
50	FairbanksMorse	1800	ball bearing	
50	FairbanksMorse	1800	ball bearing	
50	West.	1800	CS	
60	Gen. Elect.	1800	I	form K
75	Gen. Elect.	1800	I	form K
75	Gen. Elect.	900	KT	552
100	Gen. Elect.	1800	I	form K
100	West.	1800	CS	
150	Gen. Elect.	1200	I	form K
150	Gen. Elect.	1200	I	form K

MOTOR GENERATOR SETS

1—150 KW Ridgeway, 250 Volt, D.C., 1200 RPM, Direct Connected to 3 PH., 2300 V, Synchronous Motor—Complete.
1—100 KW Ridgeway sets 250 v. DC. 1200 RPM direct connected to 150 HP. Ridgeway synchronous motors, 3/2200/60/1200 complete with panels.
1—100 KW. Crocker Wheeler 250 v. DC 500 RPM direct connected to 150 HP General Electric Motor 3 PH 25 cycle 2200 volts 500 RPM, complete.
1—75 KW Ridgeway 140 v DC 1200 RPM direct connected to 120 HP Ridgeway synchronous motor 3/2200/60/1200 RPM. Complete.
1—35 KW Westinghouse Generator 125 volt DC 1450 RPM direct connected to 53 HP West. CS motor 3 ph. 25 cy. 220 v. 1450 RPM. complete .

WANTED

Write—Wire—or Phone

1—125 or 150 H.P. 230 Volt D.C. Motor. 200/1200 RPM. or any 6—1 ratio. Wire if you have this motor.

SLIPRING MOTORS

60 CYCLE, 3 PHASE, 220/440 VOLTS

HP	Make	Speed	Type	Frame
10	Gen. Elect.	1800	MT	303
15	Gen. Elect.	1800	I	form M
20	Gen. Elect.	545	MT	332
20	Westinghouse	575	CW	648A
20	Westinghouse	575	CW	ball bearing
25	Westinghouse	690	CW	
30	Gen. Elect.	1800	MT	327
30	Gen. Elect.	1800	I	form M
40	Westinghouse	690	CW	748
40	Westinghouse	690	CW	748A
40	Westinghouse	690	CW	748A
40	Westinghouse	690	CW	748A
50	Westinghouse	900	CW	
60	Westinghouse	720	CW	2200 volt
75	Westinghouse	1800	CW	
300	Gen. Elect.	1200	I	farm M
500	Westinghouse	600	CW	

TRANSFORMERS

Amt.	Kva.	Make	Cycle	Voltage
21	25	G.E.	25	2300/230/460
6	40	G.E.	5	2300/230/460
6	30	G.E.	25	2300/115/230
24	50	G.E.	25	2300/230/460
3	50	Packard	25	6900/230/460
18	50	G.E.	60	4160/4600/230/460
3	75	G.E.	60	4160/4600/230/460
18	100	G.E.	60	4160/4600/230/460
3	100	Kuhlman	25	2300/230/460
3	200	G.E.	60	2300/230/460
3	200	G.E.	60	6900/230/460
3	200	Kuhlman	60	4160/4600/230/460
3	500	Pitts.	25	11500/220
3	1000	Pitts.	60	2300/4600/230/460

Prices on Application

3 PHASE, 25 CYCLE, 220/440 VOLTS

HP	Make	RPM	Type	Frame
50	Gen. Elect.	750	I	form K
50	Westinghouse	750	CS	
75	Gen. Elect.	750	KT	357
75	Gen. Elect.	750	I	form K
100	Gen. Elect.	750	I	form K
100	Gen. Elect.	300	117	form K
150	Gen. Elect.	750	I	form K
150	Gen. Elect.	750	I	form K
200	Westinghouse	460	CS	2200 volt
200	Gen. Elect.	750	I	form K
225	Elec. Machinery	500	2200 volt	synchronous
1150	Gen. Elect.	375	2300 volt	synchronous
200	Westinghouse	235	CW	slipring

SPECIAL MOTORS

1100 H.P. General Electric Synchronous Motor, 3 ph., 25 cy., 11,500/6600/2200 V., 375 RPM
500 H.P. Allis-Chalmers, 3 ph., 25 cy., 440 V., 490 R.P.M., Complete.
300 H.P. G.E. Slipring, 25 cy., 3 ph., 2200 V., 500 RPM, 3 bearing; complete with controls.
225 H.P. Electric Mchy. Co. Synchronous, 3 ph., 25 cy., 2200 V., 500 R.P.M. with controls.
1—100 H.P. G.E. Synch. Motors, 3 ph., 25 cy., 220/440 V., with control equipment.
1—20 HP. Gen. Elec. Motor 230 v. DC. Type CD83 1750 RPM.
1—75 HP. Westinghouse Motor Type SK. 230 v. DC 475/950 RPM variable speed.

FREQUENCY CHANGERS

2—1250 KVA Gen. Elect. Synchronous—motor 3/25/2200 750 RPM. direct connected to Generator 3/62½/440 V. Complete with exciters and panels.
1—200 KW. General Electric 3 ph., 60 cy. 2300 V. direct connected to 290 HP. Gen. Elec. Synchronous Motor, 3 ph., 25 cy. 440 volt, 750 RPM Complete with panels.
1—120 KVA. Gen. Elec. Induction Frequency Changer, 440 V., 3 Phase, 62½ Cycle. Driving motor 100 H.P., 3/25/440/720 RPM. Complete.
94 KVA Westinghouse Synchronous Set Generator, 63½ cy., 230 v., 750 RPM with panels. Motor 112 HP. 3/25/2300/750 Synchronous with starting equipment.

ERIE ELECTRIC CO., INC.

124 CHURCH ST. BUFFALO, N. Y. CL. 4758

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TODAY NOT TOMORROW

Get What You Want from Stock
With Prompt Shipment

150 KW General Electric, 250 volts motor generator set, 900 RPM, 3 phase, 60 cycle, 2300 volts.

SYNCHRONOUS MOTORS

200 H.P. G.E.—TS—514 RPM.
55 H.P. Elec. Machy., 1200 RPM.

SLIPRING MOTORS

250 H.P. G.E., 600 RPM.
200 H.P. G.E., 720 RPM.
200 H.P. G.E., 514 RPM.
125 H.P. Burke, 600 RPM.
75 H.P. West., 1200 RPM. (5).
64 H.P. G.E., 585 RPM.
60 H.P. West., 1200 RPM.
60 H.P. West., 290 RPM.
(180 additional slipring motors, 1 to 50 H.P. in stock.)

SQUIRREL CAGE MOTORS

200 H.P. G.E., 600 RPM.
75 H.P. Burke, 1200 RPM.
60 H.P. G.E., 1800 RPM.
50 H.P. West., 900 RPM.
50 H.P. Allis Ch., 720 RPM.
50 H.P. G.E., 720 RPM.
50 H.P. G.E., 600 RPM.
(310 additional squirrel cage motors in stock, ¼ to 50 H.P.)

A.C. GENERATORS

150 KW G.E., 720 RPM.
100 KVA El.Machy., 1200 RPM.
100 KVA Cr.Wheeler, 900 RPM.
100 KVA West., 600 RPM.
90 KVA G.E., 900 RPM.
75 KVA West., 900 RPM.

230 VOLTS D.C. MOTOR GEN. SETS

125 KW Curtis, steam turbine dr.
150 KW G.E. 900 RPM.
(18 additional sets in stock, 1 to 25 KW.)

125 V. MOTOR GEN. SETS

35 KW Imperial 1200 RPM.
90 KW G.E.
75 KW Ridgway Syn. 1200 RPM.
35 KW West., 1200 RPM. Synch.
35 KW G.E. Steam Turbine.
(19 additional 125 V. M.G. Sets in stock, ½ to 25 KW.)

550 VOLT D.C. MOTORS

25 H.P. G.E., 875 RPM.
20 H.P. G.E., 1700 RPM.
20 H.P. G.E., 895 RPM.
15 H.P. G.E., 2100 RPM. (2).
15 H.P. G.E., 1350 RPM.
7½ H.P. G.E., 900 RPM.
5 H.P. West., 1100 RPM.
3 H.P. G.E., 1800 RPM.
(12 additional motors in stock, ¼ H.P. up.)

230 VOLT D.C. MOTORS

165 H.P. Cr. Wheeler, 670 RPM.
125 West. 1750 RPM.
100 H.P. Reliance, 1150 RPM. (2).
60 H.P. G.E., 1050 RPM.
60 H.P. G.E., 900 RPM.
60 H.P. Roth, 600 RPM.
50 H.P. G.E., 850 RPM.

230 VOLT D.C. MOTORS

40 H.P. El. Dyn., 1450/2600 RPM.
40 H.P. G.E., 1700 RPM.
40 H.P. Allis Ch., 1150 RPM.
40 H.P. Reliance, 625 RPM.
35 H.P. Ridgway, 300/800 RPM.
40 H.P. G.E., 440/800 RPM.
30 H.P. West., 500/1500 RPM.
25 H.P. G.E., 1150 RPM. (3).
25 H.P. West., 850 RPM. (2).
25 H.P. G.E., 575 RPM.
20 H.P. G.E., 1750 RPM.
(235 additional motors, ½ to 20 H.P. in stock.)

115 VOLT D.C. MOTORS

90 H.P. G.E., 900 RPM.
65 H.P. G.E., 550 RPM.
30 H.P. West., 600 RPM.
25 H.P. West., 600 RPM.
20 H.P. Sprague. 1250 RPM.
15 H.P. G.E., 1150 RPM.
10 H.P. L.A., 3600 RPM.
10 H.P. F.-M., 1150 RPM.
10 H.P. West., 850 RPM.
7½ H.P. G.E., 1750 RPM.
7½ H.P. West., 1150 RPM.
7½ H.P. G.E., 850 RPM.
(215 additional 115 volt D.C. Motors, ½ to 5 H.P., also in stock.)

MISCELLANEOUS

5 H.P. B & D 230 volt buffer.
40—A.C. & D.C. Fans and Blowers
11—Motor Driven Freq. Changers 90 to 180 cycles.
14x10 Ing. Rand. Compressor, 503 ft. at 60 lbs. pressure.
12½x12 American Compressor, 390 ft. at 125 lbs. pressure.
2—Triplex Pumps.

New York City's Largest Stock Electrical Equipment

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Over Quarter Century Serving Industry

Re-built Motors and Generators

1—400 HP, **Westinghouse**, type CW, 3 ph. 60 cy. 440 V, 450 RPM slip ring motor.

1—350 HP, **Allis-Chalmers**, 3 ph. 60 cy. 440 V, 600 RPM, slip ring motor.

1—350 HP **Burke**, 3 ph. 60 cy. 440 V, 600 RPM, slip ring motor.

1—300 HP **Allis-Chalmers**, 3 ph. 25 cy. 440 V, 485 RPM, slip ring motor

2—250 HP **Westinghouse**, type CS1012, 3 ph. 60 cy. 440 V, 600 RPM sq. cage

1—200 HP **Westinghouse**, syn. IPF 3 ph. 60 cy. 2200 V, 600 RPM, with direct connected exciter 3 or 2 bearing

2—150 HP **Allis-Chalmers**, 3 ph 60 cy. 440 V, 450 RPM, slip ring

1—200 HP **General Electric**, type 1, form K, 3 ph. 60 cy. 440 V, 450 RPM sq. cage

2—150 HP **Westinghouse**, type CW, frame 1000, 2 ph, 60 cy. 440 V, 450 RPM slip ring.

1—125 KW, **Bullock**, 3 ph. 60 cy. 2200 V, 900 RPM alternator.

2—75R, 2200 V, **Fairbanks-Morse**, 1800 RPM, 3 ph. 60 cy. slip ring motors direct connected to 500 GPM 3 stage 300 head pump

1—50 HP, **Ideal**, type SMS, 3 ph. 60 cy. 220 V, 1800 RPM, syn. DC exciter

1—40 HP **Fairbanks-Morse**, 3 ph. 60 cy. 2200 V, 3600 RPM, type HD. (new)

1—100 HP **Westinghouse**, type SK, frame 160, 230 V, 1100 RPM.

1—100 HP **General Electric**, type CD, frame 123, 230 V, 1200 RPM.

1—100 HP **General Electric** type RF 17 230 V, 400/1200 RPM

1—75 HP **Reliance**, 230 V, frame 985T 400 to 1200 RPM

3—75 HP, **Westinghouse**, type SK, frame, 150, 230 V, 1100 RPM

1—50 HP, **Westinghouse**, type SK, frame 160, 230 V, 565 RPM

1—50 HP **General Electric**, class 5 Form B, 600 V, 600 RPM

1—60 HP **Westinghouse**, type SK, frame 160, 230 V, 680 RPM

1—100 HP **Westinghouse**, type CCL, 3 ph. 60 cy. 220 V, 1750 RPM sq. cage

1—100 HP **Wagner**, type 26V5VBP, 3 ph. 60 cy. 440 V, 860 RPM sq. cage

1—100 HP **Allis-Chalmers**, type ANY, 3 ph. 60 cy. 220 V, 690 RPM slip ring

1—75 HP **Allis-Chalmers**, 3 ph. 60 cy. 440 V, 450 RPM, slip ring

1—75 HP **Westinghouse**, type CW, 3 ph. 60 cy. 440 V, 720 RPM slip ring 3 or 2 bearing.

1—75 HP **Fairbanks-Morse**, type H, frame 165C, 3 ph. 60 cy. 550 V, 900 RPM sq. cage

2—75 HP, **General Electric**, type I, 3 ph. 60 cy. 220 V, 720 RPM, sq. cage

1—75 HP **Lincoln**, type IQ, 2 ph. 60 cy. 440 V, 600 RPM, sq. cage

1—75 HP **General Electric**, type CD, frame 176-550 V, 250/1000 RPM (planer)

2—40 HP **C&C**, 230 V, 250/1000 (Planer)

1—30 HP **C&C**, 230 V, 250/1000 (Planer)

1—20 HP **C&C**, 230 V, 250/1000 (Planer)

1—10 HP, **C&C**, 230 V, 250/1000 (Planer)

1—7½ HP, **Reliance** 230 V, 250/1000 planer

The Wente Electric Co.

207 N. Fourth St. Hamilton, Ohio

Est. 1903

Two Heavy Duty
DIESEL DRIVEN GENERATORS
BRAND NEW—NEVER USED!
3/60-440 Can Drive 350 KWS
Built By RUSTON HORNSBY LTD. of LINCOLN, ENGLAND

SPECIFICATIONS

Quantity
2—Ruston Vertical Diesel Engines, 440 H.P., 4 cycle, solid injection: 8 Cylinders 11x14½—428 R.P.M.

2—Model 15-D Gould Hydroil Fuel Oil Purifiers, direct connected to half horse power polyphase induction motor.

2—Alternators Ideal Electric & Mfg. Co., U. S. A. 150 K.W., 400 R.P.M., 3/60—440 V. 40 degree, 80% power factor engine type synchronous alternators with field discharge rheostats, field discharge resistance, damper windings and split rotor.

2—D.C. Belted Exciters mfgd. by Ideal Electric & Mfg. Co., U. S. A. 5 K.W., 1800 R.P.M. 125 volts, 40 degree shunt wound interpole types.

Quantity
1—Lexington Electric Switchboard, Seven Panels, 19 Nameplates, fused. Buss 800 amperes at current density of 800 amperes per sq. in. Instruments are Weston rectangular. Further information on request.

1—Struthers Wells Type F Oil Engine Exhaust Gas Cooler, containing 100—2" OD #10 BWG seamless steel tubes 12' length. Shell side working pressure 120# sq. in.

1—Struthers Wells Type NB-2 water to water exchanger containing 16 1¼" steel tubes 10' length. Working pressure on shell side 50# sq. in. and 100# sq. in. on tube side.

Various belting, tanks, etc.

• PRICES ON APPLICATION •

See illustrated advertisement page 296 Oct. issue of Power or write for illustrated booklet.

ARNESSEN ELECTRIC COMPANY
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ELECTRICAL EQUIPMENT

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TURBO GENERATORS

MOTOR GENERATORS

TRANSFORMERS ETC.

What have you for sale or what do you need?

GEORGE SACHSENMAIER CO.
8403 Hegerman St.
Phila., Pa.

POWER PLANT EQUIPMENT

TURBO-GENERATORS

1—3000 KW G.E. 600 V. Cond.
1—2500 KW G.E. 2300 V. Cond.
1— 625 KW Terry-Allis—600 V.Cond.
1— 500 KW G.E. 240 V. Cond.
1— 500 KW G.E. 2300 V. Mixed P.
1— 500 KW G.E. 600 V. Cond.
1— 175 H. P.G. E. Turbine—only.

AIR COMPRESSORS

1—2588 Cu. Ft.—AIR—Steam Driven. Cond.
1—782 Cu. Ft.—IR—55#.
1—599 Cu. Ft.—IR—2 stage Belted.
1—146 Cu. Ft—IR—3 stage Belted 2000#

G.E. CENTRIFUGAL COMPRESSOR

Type WM—675—8800/10800.
Volume—8800/10800 Pressure 32/39.6.
Driven by 820 H.P. G.E. Turbine.
Condition excellent.

BOILERS

2—500 H.P. Heine 200#.
1— 60 H.P.HRT—125#.

WATER WHEEL

1—625 KVA, Morgan Smith 42' Hd.

BELTED GENERATOR

1—500 KW. G.E. 550 V. 225—RPM.

INDUCED DRAFT FAN

1—126,000 CMF to 210 HP Turbines.
1—165,000 CFM to 450 HP Turbine.

Also transformers, engines and cranes
Send us your inquiries

A. LEE ELLIS CO., U. S. Mchy. Bldg., Boston, Mass.
The Buyer Must Be Satisfied—Always

FOR SALE
BOILERS

4—500 H.P. 200 lb. W.P. B & W Serpentine header W.T. Boilers.
2—500 H.P. 200 lb. W. P. Edge Moor W. T. boilers. Complete with Laclede Christie Chain grate stokers and all access.

JOS. SULLIVAN CO.
523 N. Hamlin Ave. Chicago, Ill.
Phone Van Buren 8669

Direct Current Generators

1—40 KW C-W Type CCD, 250 v., 1100 RPM
1—45 KW C-W Type CCD, 250 v., 1100 RPM.
1—25 KW GE Type 250 v., 900 RPM Generator.
1—5 KW GE Type CD 250 v. M G. Set.
1—45 KW GE Type ATB Form P.B. 550 v., 3 ph. Alternater.

MILTON WERBY & CO.
423 Atlantic Ave. Boston, Mass.

Boilers—Stokers—Tanks

2—250 HP Murray 160# boilers with Firite stokers.
2—350 HP 175# with forced draft Stokers
1—75,000 and 50,000 gal. elevated Water Tanks on 100' towers.

H. A. WOODWORTH ENGINEERING CO.
705 Olive Street St. Louis, Mo.

REBUILT POWER EQUIPMENT

Available Immediate Delivery

ROTARY CONVERTERS

1—200 kw. G.E. 275 v. 900 rpm., 6 ph. 60 cy. complete with overspeed device and transformers.

1—500 kw. G.E. type HC-8 600 volt, 900 rpm., 6 ph., 60 cy. pedestal bearing with overspeed device complete with transformers.

MOTOR GENERATOR SETS

500 Amp. West. Arc Welding M.G. Set 75 v. 870 rpm. dir. con. to 220/550 v. 3 ph. 60 cy.

200 kw. Westinghouse 600 v. D.C. 600 rpm., dir. con. 2200/3/60 Syn. Motor. Complete.

125 kw Crocker Wheeler 250 V. D.C. 1200 rpm., 220/440 v., 3 ph. 60 cy. induction

100 kw. G.E. 550 v. 900 rpm. dir. con. 2200/3/60 Syn. Motor.

ENGINE GENERATOR SETS

225 kw. Elec. Machy. 2200 or 220 v. 2 ph. 60 cy. dir. con. Ideal Steam

100 HP. LIDGERWOOD HOIST

Double drum Speedwell 2500 lb. pull at 450' per min. direct driven by 100 hp. A.C. or D.C. Motor.

A.C. GENERATORS

219 kva. G.E. 2300/3/60 200 rpm, 80% P.F. (Can be reconnected 440 or 220 v.)

GAS ENGINE GENERATOR SET

75 kw. West. 250 v. velted to 110 HP 2 cyl. Bessemer Gas Engine.

SLIPRING MOTORS—3 ph. 60 cy.

No.	HP	Make	Type	Volts	Rpm.
1	1500	Allis Chal.	ANY	2200	485
1	700	G.E.	MT-432	2200	393
1	400	West.	CW	2200/550/220	435
1	400	West.	CW-967A	220/440	1170
1	300	G.E.	I-M	220/440	600
1	260	Burke	EMV-65	220/440	600
3	250	G.E.	I-M	550	600
3	250	G.E.	I-M	2200/220/440	009
3	200	G.E.	I-M	2200/220/440	600
1	200	G.E.	I-M	2200	514
1	150	G.E.	I-M	220/440	900
1	100	West.	CI	220/440	1750
1	75	West.	CI	220/440	860

SYNCHRONOUS MOTORS

4—150 HP. Allis Chal. 2200/3/60 1200 rpm. 70% P.F. 125 v. exciter dir. conn. thru coupling to 4—Falk Reduction Gears, ratio 1200—164 rpm. complete with control.

TURBINE

1—Kerr Economy Steam Turbine 450 B.H.P. 3300 rpm. 5" intake. 12" exhaust with Kerr Reduction Unit 3800 to 720 rpm. 115 lbs. pres.

SPEED REDUCERS

4—3 to 10 HP Thomas, Ratio 100 to 1; 15 to 1; 10 to 1; 5 to 1.

3—2 HP Crocker Wheeler 925 to 73 rpm.

3—7½ HP Crocker Wheeler ratio 50 to 1.

1—150 HP. R.D. Nuttal ratio 1.6:1.

4—150 HP. Falk Co. Reduction Gears, ratio 1200—164 rpm.

1—450 HP. Kerr Reduction Gear, 3800 to 720 rpm.

1—4½ to 7½ HP Link Belt Herringbone ratio 59.4 to 1.

1—30 HP Falk Ratio 15.7 to 1.

TRANSFORMERS—1 ph. 60 cy.

3—1500 Kva. Pittsburgh Transformers, 22,000 volt Primary, 6900/6600/2200 volt secondary.

No.	Kva.	Prl.	Sec.	Make	Ph.
1	220	2300	115/230	All. Ch.	3 ph.
3	150	22000	6000	Pgh.	
1	150	2200	230/460	G.E.	3 ph.
1	100	2200	110/220	G.E.	3 ph.
1	100	2200	110/220	West.	
3	100	6600	550/440/220	Pgh	
1	100	2200	220/110	West.	
2	75	2200	220	Burke	3 ph.
2	50	2300	220/440	G.E.	1 ph.
3	50	11430/6600	550	Al. Ch.	
3	50	6600	575	G.E.	
1	50	2200	220	Burke	
3	50	2200	110/220	West	
5	50	2200	110/220	G.E.	
1	37½	2300	220/440	Wagner	
3	37½	22000	2200	West.	
3	37	4400	185	West. (Rotary)	
1	30	2200	110/220	G.E.	
25	25	2200	110/220	G.E.	
1	25	550	110/220	G.E.	1 ph.
3	20	2200	110/220	G.E.	
1	20	1100/2200	110/220	Pgh.	1 ph.
10	15	2200	110/220	G.E.	

AIR COMPRESSORS

2—260 CFM Chic. Pneu. 12x10, 100# pres. 285 rpm. belt driven by 40 HP G.E. AC slipring Motors.

SQUIRREL CAGE MOTORS—3 ph. 60 cy.

HP	Volts	Make	Type	Speed
500	2200/440/220	West.	CS	720
400	2200/440/220	West.	CS	500
450	2200/440/220	West.	CS	600
400	2200/440/220	West.	CS	600
350	2200/440/220	West.	CS	450
300	2200/440/220	West.	CS	400
200	2200/440/220	West.	CS	250
200	220/440	West.	CS	580
200	2200	West.	CS	870
150	550/220/440	G.E.	—	575
150	220/440	G.E.	KT-562	690
150	2200/440/220	Al. Ch.	Syn.	1200
125	550/220/440	Al. Ch.	—	1750
100	2200/220/440	G.E.	I-K	600
100	220/440	Al. Ch.	—	1200
100	220/440	West.	—	1750

SQUARING SHEAR

1—40" shear, 18" material. American Steel & Wire Co., Canton, Ohio.

INDUSTRIAL TRUCKS

8—Yale & Towne, 4000 lbs. Cap. 54" lift. Roller Bearing, Prongs 27" with batteries.

1—Baker Tow Truck, Ready Power, Gasoline Electric Power Unit.

3—Elwell Parker Tow Tractors with batteries.

43—Small steel Trucks, 300 to 400 lbs. Roller Bearings.

LIFTING MAGNET

1—36" dia. Chio Magnet, 220 v. size MT 86.

ELEVATOR

1—Westinghouse Elevator, traction type, 3000 lbs. Cap., platform 6x5, 2 gates on car, 4 sets of bi-parting doors, planed steel tees for main guides complete with AC motor and constant pressure control. All automatic.

WRITE, WIRE OR PHONE YOUR ELECTRICAL REQUIREMENTS

DUQUESNE ELECTRIC & MFG. CO., PITTSBURGH, PA.

MOTOR GENERATOR SETS

150 KW G. E. 514 rpm 4 bearing: 200 HP 3-60-2250V-ATB Synch. motor coupled to 150 KW 250 V DC 600 amps 2 wire MP generator.

16 KW G. E. 1750 rpm 3 bearing: 25 HP 3-60-440-KT503S motor coupled to 12 KW 250 V DC CD83 generator.

12 KW G. E. 1750 3 bearing: 20 HP 3-60-440-KT501S motor coupled to 12 KW 250 V DC generator.

Also complete stock of standard AC and DC motors and control, transformers, large DC air circuit breakers, generators, etc.

SANDMAN ELECTRIC MOTOR COMPANY

ELECTRICAL ENGINEERS • NEW ENGLAND'S LEADING DEALER

47 PURCHASE STREET • BOSTON, MASSACHUSETTS

SYNCHRONOUS CONVERTERS

500 KW WEST. 250 D.C. 2300/4000 A.C. 1200 RPM
200 KW AL-CH. 250 D.C. 2300/4000 A.C. 1200 RPM
150 KW R.W. 250 D.C. 2300/4000 A.C. 1200 RPM

MOTOR GENERATORS

300 KW WEST. SYN. 600 V. 2300 A.C. 900 RPM
200 KW G.E. SYN. 250 V. 2300 A.C. 720 RPM
200 KW G.E. SYN. 600 V. 2300 A.C. 720 RPM
200 KW G.E. IND. 250 V. 440 A.C. 720 RPM
200 KW G.E. IND. 600 V. 2300 A.C. 1200 RPM
200 KW R.W. SYN. 250 V. 2300/4000 A.C. 900 RPM

TURBO GENERATOR SET

300 KW GENERAL ELECTRIC-CURTIS Turbine 3600 RPM, Non-Condensing, 100# Steam Pressure. GEN. ELEC. Generator 300 KW, type MPC, 250 V. D.C., 1200 RPM.

Each unit listed above is owned by us and is Available now for immediate purchase.

WALLACE E. KIRK CO.

Incorporated

502 Grant Building Pittsburgh, Pa.

---

300 KW ROTARY CONVERTER

1—300 KW Westinghouse Rotary Converter, 600 volts D.C. 6 ph. 60 cy., pedestal bearings, 1200 RPM.

TRANSFORMERS

1—750 KVA Uptegraff 3 ph., 6600-4000.
1—100 KVA Pittsburgh 2200-220/440.
3—75 KVA Pittsburgh 4000-220/440.
3—37½ KVA Westghse 4000-230/460.
1—37½ KVA Westghse. 2200-440.
2—37½ KVA Westghse. 2200-110/220.
1—37½ KVA Pittsburgh 2300-230.
1—15 KVA Pittsburgh 550-110/220.
1—10 KVA Allis. Chal. 600-115/230.
1—5 KVA Westghse 2200-110/220.
10—1½ KVA Gen'l. Elect. 2200-110/220.

ELECTRIC EQUIPMENT FOR INDUSTRY

LET US KNOW YOUR REQUIREMENTS

60 KW MOTOR GENERATOR SET

1—60 KW Westinghouse Synch. Motor Gen. Set, Type SK Generator for 125 volts D.C. compound wound, 90 HP. Type G Synch. Motor for 3-60-220 volts, complete with semi-automatic control unit.

MILL AND CRANE MOTORS

CO-2011, MDS-109½, MC-90, CO-1812 MDS-108, CO-2007. CO-1810.

230 V.D.C. MOTORS

1—150 HP., W.E. Co., Type SK, 1750 RPM.
1—75 HP., W.E. Co., Type SK, 575/1150 RPM.
6—20 HP., G. E. Co., Type RC, 1150 RPM.
5—15 HP., G.E., Type LC, 500/600 RPM.
3—13½, W.E. Co., Type SK, 730/1460.
1—15 HP., G. E. Co., Type RC, 850 RPM.
5—15 HP., C. W. Co., Type CM, 1400/1700 RPM.
2—5 HP., G. E. Co., Type RC, 1150 RPM.
1—5 HP., W. E. Co., Type SK, 1100 RPM.
4—3 HP., W. E. Co., Type SK, 1150 RPM.

FREQUENCY CHANGERS — TURBO GENERATORS — AC & DC MANUAL MAGNETIC CONTROL — CENTRIFUGAL PUMPS — AC & DC SWITCHBOARDS

FOR DETAILS, WRITE **JOHN D. CRAWBUCK CO.** *714-15 EMPIRE BLDG. PITTSBURGH, PENNA.*

POWER EQUIPMENT FOR PROMPT SHIPMENT

SQUIRREL CAGE MOTORS (3ph. 60 cy.)

HP	Make	Volts	Speed	Type
700	G.E.	6600	1800	
450	West.	2200/220/440	50	CS
400 (5)	West.	2200/220/440	500	CS
350	West.	2200/220/440	500	CS
200	Al.Ch.	2200	600	
150	West.	220/440	580	CCL
125/40	Cr.Wh.	2200	700	125 AQ
125	Burke	220/440	1200	
125	Cr.Wh.	2200	700	125 AQ
100	Burke	220/440	900	
100	F. M.	220/440	600	BB

DC SERIES WOUND MOTORS

HP	Make	Type	Speed
15	West.		650
25	Shaw		600
30	G.E.	CO2002	610
35	G.E.	CO2507	640
35	Cr. Wh.	SM	565
50	Shaw		600
75	G.E.	211 Int.	550
100	G.E.	MD108	480
175	G.E.	MDS 1901	475

SYN. MOTORS, 3 ph. 60 cy.

HP	Make	Volts	Speed
700	G.E.	6600	1800
300	Al.Ch.	2200	600
75(2)	G.E.	2200	900
75	Westgh	220	1800

SLIP RING MOTORS (3ph. 60 cy.)

HP	Make	Volts	Speed	Type
1000	Al. Ch.	440	235	
700	G.E.	2200	393	MT 432
300	G.E.	440	600	I-M
250	G.E.	2200	600	I-L
200	G.E.	2200	600	I-L
200	Cr.Wh.	2300	440	28
200	G.E.	2200	240	MT 412
150	G.E.	220	575	I-M
150	G.E.	2200	600	I-L
125	G.E.	2200	600	I-L
125	Al.Ch.	2200	435	
100	Al.Ch.	220/440	575	
100	G.E. -25 cy.	220/440	500	MI-108
100	G.E.	220	850	I.M

OIL ENGINE DRIVE AIR COMPRESSOR

Chicago Pneumatic simplate valve type NSO3 straight line 16½ & 11 x 18" capacity 492 cu. ft. displacement, 100# pressure, with air receiver and starting air compressor.

M-G SETS 3 ph. 60 cy. (Syn.)

150 KW West. 550 v. DC—2200 AC 1200 RPM
125 KW Cr. Wh. 250 v. DC—440 v. AC 1200 RPM
100 KW Ridgway 250 v. DC—2200 AC 1200 RPM.
90 KW Al. Chal. 230 v. DC 2200 v. AC 900 RPM

SHOP HOISTS

1—1 Ton Sprague 230 v. DC
2—2 Ton Sprague 230/500 v. DC Monorail
1—4 Ton Sprague 230/500 v. DC Monorail.

In addition to the above, we have hundreds of other items in stock—kindly send us your inquiries.

MOORHEAD-REITMEYER CO., INC.

Pittsburgh, Pennsylvania

IF YOU DON'T KNOW MACHINERY—KNOW YOUR MACHINERY DEALER

1—DC GENERATOR SET

Gasoline-driven

Star Generator: 28 V, 400 amp. SB20 W
Engine: Buffalo, Type BA.
Complete with Panel.

1—AC GENERATOR SET

Gasoline-driven

Westinghouse Generator: 48 KVA, 3 phase, 120/240/480 V; 28 KVA, single phase, 120/240 V, 117 amp., 1800 rpm, 60 cyc., direct connected exciter.
Engine: Continental, 6 cylinder gasoline engine, complete with Switchboard with Circuit Breaker, Voltmeter, ammeter and Silverstat Regulator.

Electric Apparatus Repair Co.
1410-12 North Sixth Street Phila., Pa.

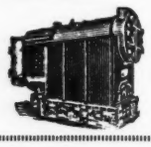
ALL SIZES AND ALL TYPES

BOILERS RENTED

A.S.M.E. ALL PRESSURES

INDUSTRIAL POWER HEATING

WE BUY



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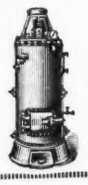

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59 FLUSHING AVE. MAIN 4-5880 BKLYN, N. Y.

DIRECT CURRENT UNIFLOW ENGINE GENERATOR SETS

1—100 KW G.E. Generator Type MPC-6-100, 260 RPM, Frame LD, 400 Amps. 250 V., Ser. #998963. Dir. Con. to Skinner Engine #9752, 14x16. Right hand automatic Universal Uniflow Engine. New 1919.

1—200 KW Sprague G.E. Generator Type S, 200 RPM, 800 Amps., 250 V., Ser. #212323. Dir. Con. to Ames Iron Works Engine #41650, 19x24. Right hand automatic Uniflow Engine. Frame No. M-2. New 1918.

Philadelphia Transformer Co.
2829 Cedar St. Phila., Penna.

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CUT TO SKETCH ⅛ to 24"

METROPOLITAN
PLUMBING SUPPLY CO., INC.
INDUSTRIAL AND MARINE SUPPLIES
Large SURPLUS STOCKS
STEEL—WROUGHT IRON—CAST IRON
BRASS-COPPER-CEMENT LINED PIPE
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HOURLY NATION-WIDE SHIPMENTS
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FLANGED VALVES & FITTINGS

BOILER FEED PUMPS, Etc.

2—**Davidson,** simplex, brass fitted, double acting, piston pattern, **Feed Pumps,** size, 14"x9¼"x16", governor and relief valves, (1) new water end cylinder.
1—**Gould's,** (5) stage, centrifugal **Boiler Feed Pump,** mounted on common base with companion coupling arranged for motor drive, check & control valves.
1—**Clarage Forced Draft Fan,** ball bearing, belt driven, pulley on each end of shaft.
5—sets V belt **Pulley Drives,** (4) belts, 25 H.P.

H. P. BREARLEY
3423-91st Street, Jackson Heights, N. Y.

GAS COMPRESSOR

1200# — Worthington, three-stage, steam-driven, Gas Compressor.

DENNY & CLARK
910 No. Marshfield Avenue, Chicago

DIESEL UNIT

150 KW—200 HP—3 plant 2300 v. 257 R.P.M.
Mackintosh Steam Roller with Auxiliaries, fittings & tools
(Others from 15 KW to 800 KW)

STEPHEN A. DOUGLASS CO.
630 Fort Washington Ave., New York, N. Y.

FOR SALE

3—20 Ton, 5 Ton & 2 Ton **O.E.T. Cranes**
1— 10 Ton & 5 Ton **Overhead Elec. Hoists**
1—75,000, 50,000 & 35,000 Gal. **Tanks & Towers**
1—#3 **Universal Grinder**—Motor Drive
2—357 HP **Heine Type,** 165# P., **W.T. Boilers**
2—500 KW **Cond.** or **Non-Cond. Turbo—Gen. Sets**
1—8200 sq. ft. **Alberger Surface Condenser**
1—150, 120, 65 & 25 HP **Diesels;** Ex. Cond.

H. & P. MACHINERY COMPANY
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33 N. SUPERIOR ST.
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OVER 10,000 ITEMS IN STOCK FOR IMMEDIATE DELIVERY FROM EITHER ROCHESTER, N. Y. OR TOLEDO, OHIO REBUILT AND SOLD WITH A STANDARD NEW GUARANTEE.

MOTORS, GENERATORS, CONTROLS, TRANSFORMERS, MOTOR GENERATOR SETS, etc.

BERGER BROTHERS ELECTRIC MOTORS INC.
395 STATE ST.
ROCHESTER NEW YORK

SEARCHLIGHT SECTION

SLIP RING MOTORS, 3 PH., 60-CY.

HP	Volts	Make	Speed
500	2300	Whse.	450
350	220-440	G.E.	1800
250	2200	G.E.	600
300	2300-4000	G.E.	1200
250	440-550	G.E.	600
200	2200-550	G.E.	1800
200	2200-440	G.E.	600
150	440-220	G.E.	1800
150	2200	G.E.	900
150	2200-440	Whse.	1800
150	550-2200	G.E.	1800
100	550-2200	G.E.	720
100	220-440	G.E.	720
100	220-440	G.E.	900
80	220-440	G.E.-MTC	900
75	440-220	G.E.	900
75	220-440	G.E.	600

SYNCHRONOUS MOTORS, 3-PH., 60-CY.

500	2200-440	G.E.	720
600	2200	Whse.	900
400	440-220	Whse.	76
350	440-220	G.E.	200
240	2300-440-220	G.E.	600
200	2300-4000	G.E.	1200
150	2200	G.E	1800
100	440-220	G.E.	1200
50	220-440	G.E.	1200

TRANSFORMERS—60 CYCLE

3—667 kva., Whse. 22000-2300.
3—500 kva., Whse. 22000-2300.
3—400 kva., G.E. type H, 13200-440.
3—250 kva., Al. Chal. 4150-480.
3—250 kva., Whse. 13,800-460.
3—200 kva., G.E., H-KD 6600-2300/4000Y., 25 cy.
3—175 kva. G.E. 4000-480.
2—150 kva., Whse. 4800/4156/2400-480/240.
1—100 kva., Pittsburgh, type OISC 2400-240-120.
3—100 kva., G.E., type H 2400-240/480.
3—100 kva., G.E., type H-KDD, 6900/11950Y-230/115.
3—100 kva.,Whse. 22,000-2300.
2— 75 kva., G.E., type HK, 2300-230/115.
3— 50 kva., Moloney, 2300-230/115.
6— 50 kva., Whse. type SK, 13800-240/120.
3— 50 kva., Whse. 22,000-2300.
3—37½ kva., G.E., type H-K 2200-460.
3—37½ kva., G.E., type H-K 2300-230/115.
3—25 kva., G.E., type H-K 2300-230/460.

A. C. GENERATORS

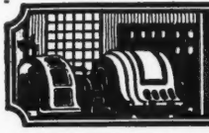
1—500 kva., 900 r.p.m., 2209 V. Whse. Condenser.
1—312 kva., 900 r.p.m., 2300 V., Westghse.
1—300 kva., 600 r.p.m., 240-480-V., G.E.
1—225 kva., 600 r.p.m., 2200-240-V., G.E.
1—187 kva., 900 r.p.m., 2200-550-V., Westghse.

SQUIRREL CAGE MOTORS

HP	Volts	Make	Type	Speed
500	440/220	G.E.	IK	1200
500	440/220	G.E.	IK	900
400	2200	Whse.	C.S.	1800
250	2200	G.E.	IE-K	1800
250	2200	G.E.	I-K	600
200	220/440	G.E.	IK	720
150	2200	Allis. Ch.	AN	450
100	2200	G.E.	IK	600
100	2200	G.E.	IE-K	1800
100	550	G.E.	KT	900
100	220/440	G.E.	KT	720
75	2200	G.E.	KT	900
75	2300	G.E.	IE-K	1800
50	220/440	G.E.	K	1800

MOTOR GENERATOR SETS

1—100 K.W., 250 V., 1200 R.P.M., Ridgeway, con. to 150 H.P., 2200 V., 3 ph., 60 cy., syn. motor.
1—60 K.W., 125 V., 1200 R.P.M., G.E., type RC to 90 H.P., 4150/2300 V., 3 ph., 60 sy. syn.
1—25 K.W., 125 V., 1800 R.P.M., G.E., con. to KT 40 H.P., 2200/440 V., 3 ph., 60 cy. motor
1—300 K.W., 250/275 V., 1200 R.P.M. Connected to 450 H.P. 4000/2200 V. 3 ph., 60 cy., syn.



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FOR SALE

We offer 523, 55-ton all-steel, self-clearing

DOUBLE HOPPER CARS

consisting of:

160 USRA construction; built 1921-1922; with A-B brakes; 1880 cubical feet capacity.
363 built 1910-1915; with KD-1012 brakes. 1683 feet capacity.

ALL HAVE FULL "U" CAST STEEL TRUCK FRAMES

Purchaser must buy all.

PRICE: $1700.00 each f.o.t. Pennsylvania.

TERMS: Cash with purchase.

DELIVERY CAN COMMENCE IMMEDIATELY AND BE COMPLETED IN ABOUT 60 DAYS—AND VERY POSSIBLY SOONER

Some $30,000 to $40,000 NEW REPAIR MATERIALS also available which you may wish to have inspected at the same time.

TIME and EXPEDITION ESSENTIAL and DESIRABLE.

Your for Victory,

IRON & STEEL PRODUCTS, INC.

37 years' experience

13488 S. Brainard Ave. **Chicago, Illinois**

"ANYTHING containing IRON or STEEL"

Liquidation!

FROM SALT LAKE CITY, UTAH:

1—BATTERY OF 2—250 HP, 150# PRESSURE, B. & W. STERLING TYPE BOILERS, COMPLETE WITH BRICK SETTINGS, TOGETHER WITH ALL ACCESSORIES INCLUDING 5' x 75' HIGH STACK, WITH 4 WEBSTER GAS BURNERS, WITH AUTOMATIC CONTROLS.

1—520 HP HAMILTON CORLISS ENGINE GENERATOR SET, DIRECT CONNECTED TO G. E. 360 KW GENERATOR, 3/60/480 VOLT, 150 RPM, WITH G. E. EXCITER AND WESTINGHOUSE 3 PANEL SWITCHBOARD. (USED WITH ABOVE).

20—MOTORS, FROM 3 TO 100 HP, 3/60/440 VOLTS.

10—CENTRIFUGAL PUMPS, FROM 1½" TO 3".

FROM MISSOURI:

2—Allis-Chalmers—Kerr Turbo Generators, 500 KW, 3/60/480 volt, equipped with Westinghouse Blanc Jet Condensers. Turbine operated condensing or non-condensing at back pressure of 10-15 lb. Complete with switchboard and exciter.

2—Heine Type 357 HP, 2 drum O'Brien Boilers, with Laclede Christie chain grate automatic stokers, 175#.

3—Electrolytic Generators: Westinghouse 2000 amp., 200/40 volt; Allis Chalmers 1250 amp., 40/120 volt; Allis-Chalmers 833 amp., 40/120 volt.

2—Swaby Centrifugal Pumps, 6", 8".

1—Alberger Vacuum Pump, steam driven, 8" x 16" x 12".

1—Laidlaw Dunn Gordon two stage steam driven Compressor, 100 lb. pressure, 1300 cfm.

2—Connorsville and Root Type SH Pressure Blowers, 24" suction and discharge, 47 and 65 of capacity.

"Your inquiries solicited"

BRILL Equipment Co.
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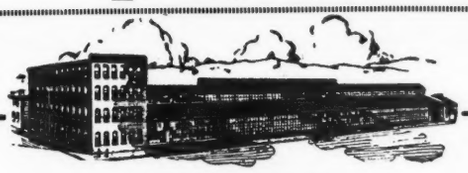

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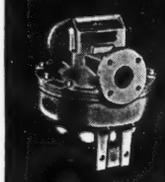

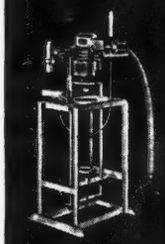

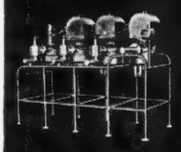

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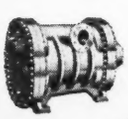

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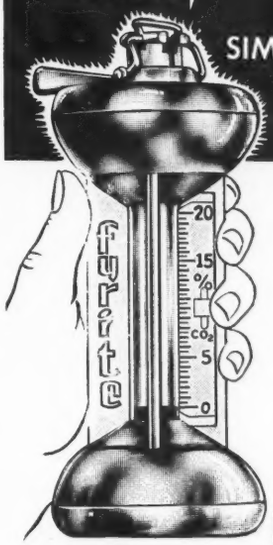

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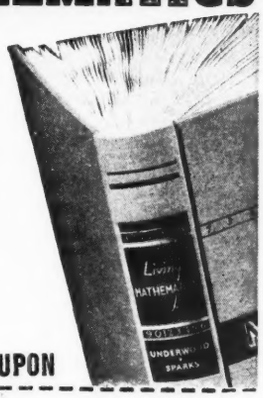

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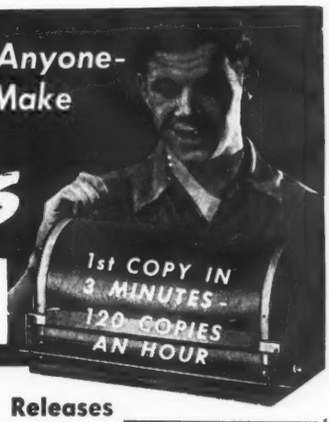

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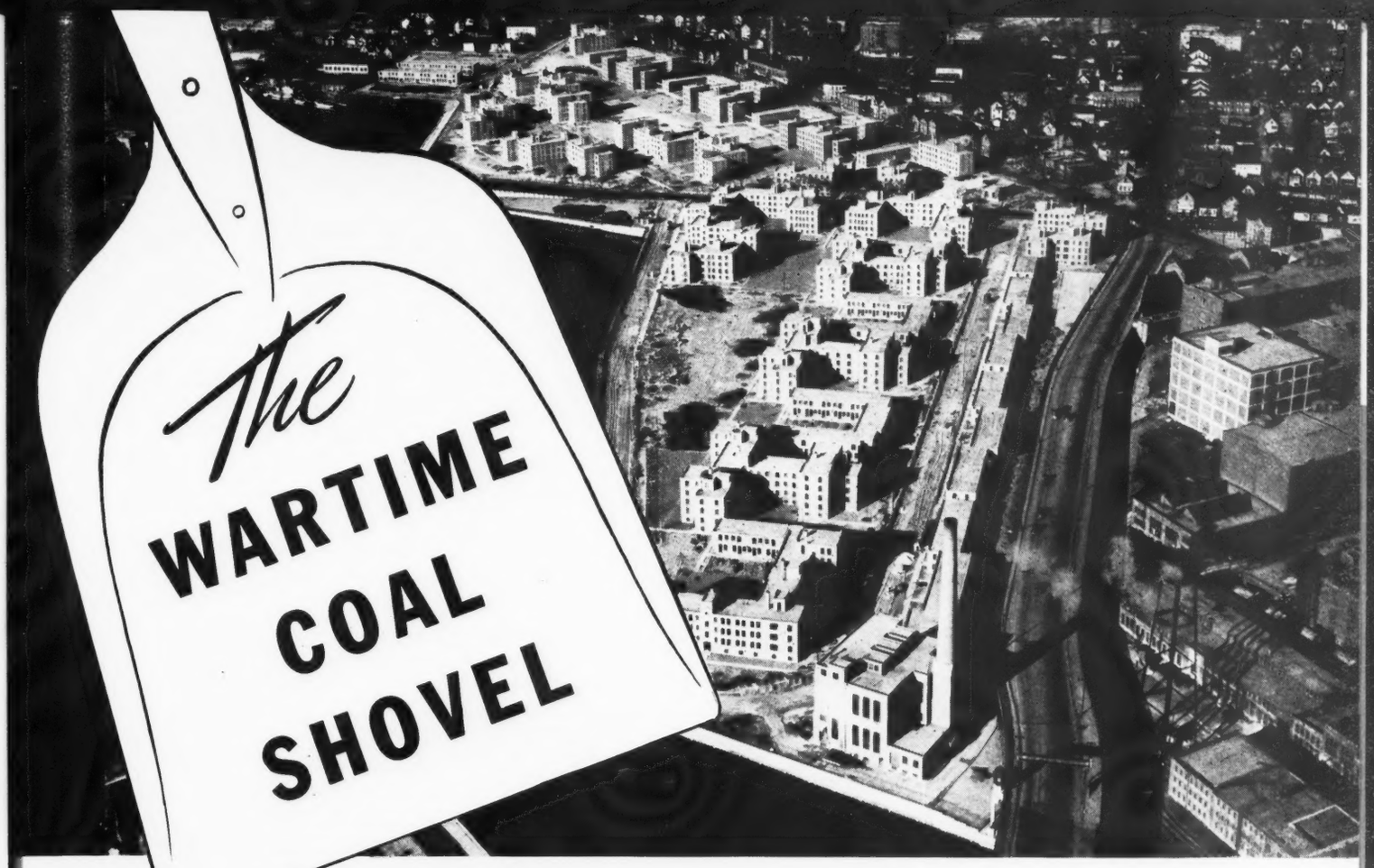

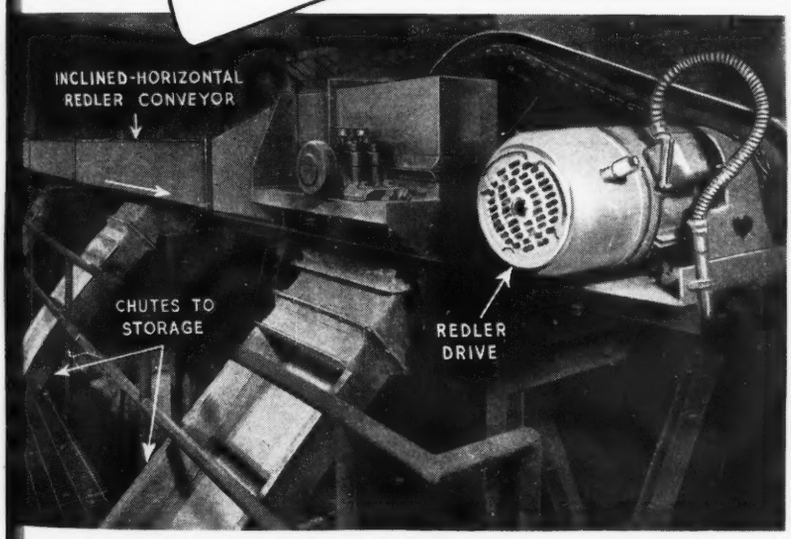

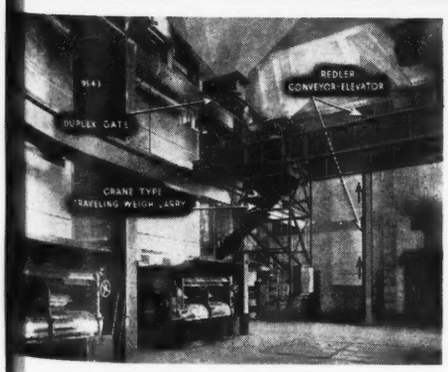

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The Simple S-A Equipped Power Plant of the Lathrop Project Showing Weigh Larry —and Redler Elevator at Right.

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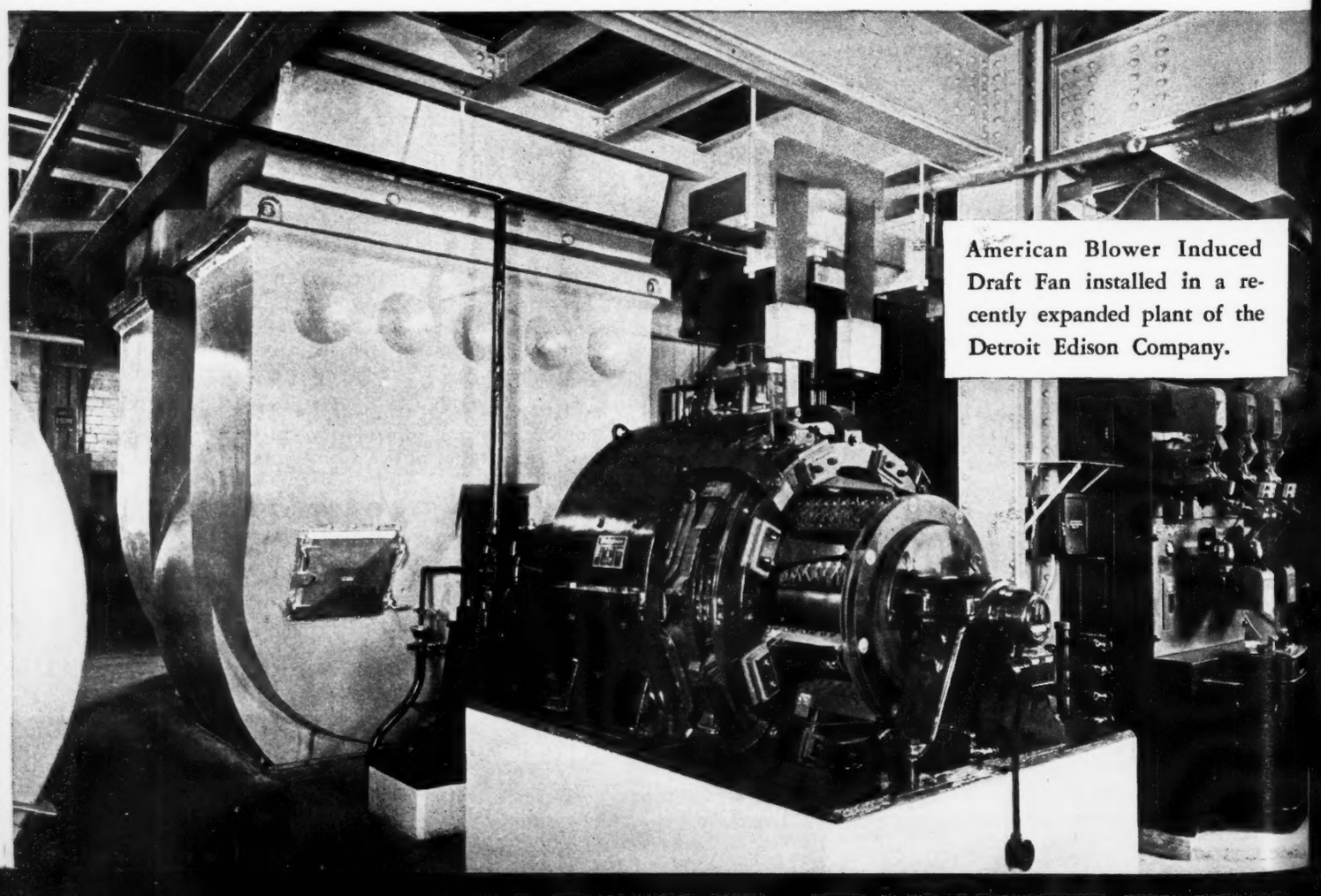

American Blower Induced Draft Fan installed in a recently expanded plant of the Detroit Edison Company.

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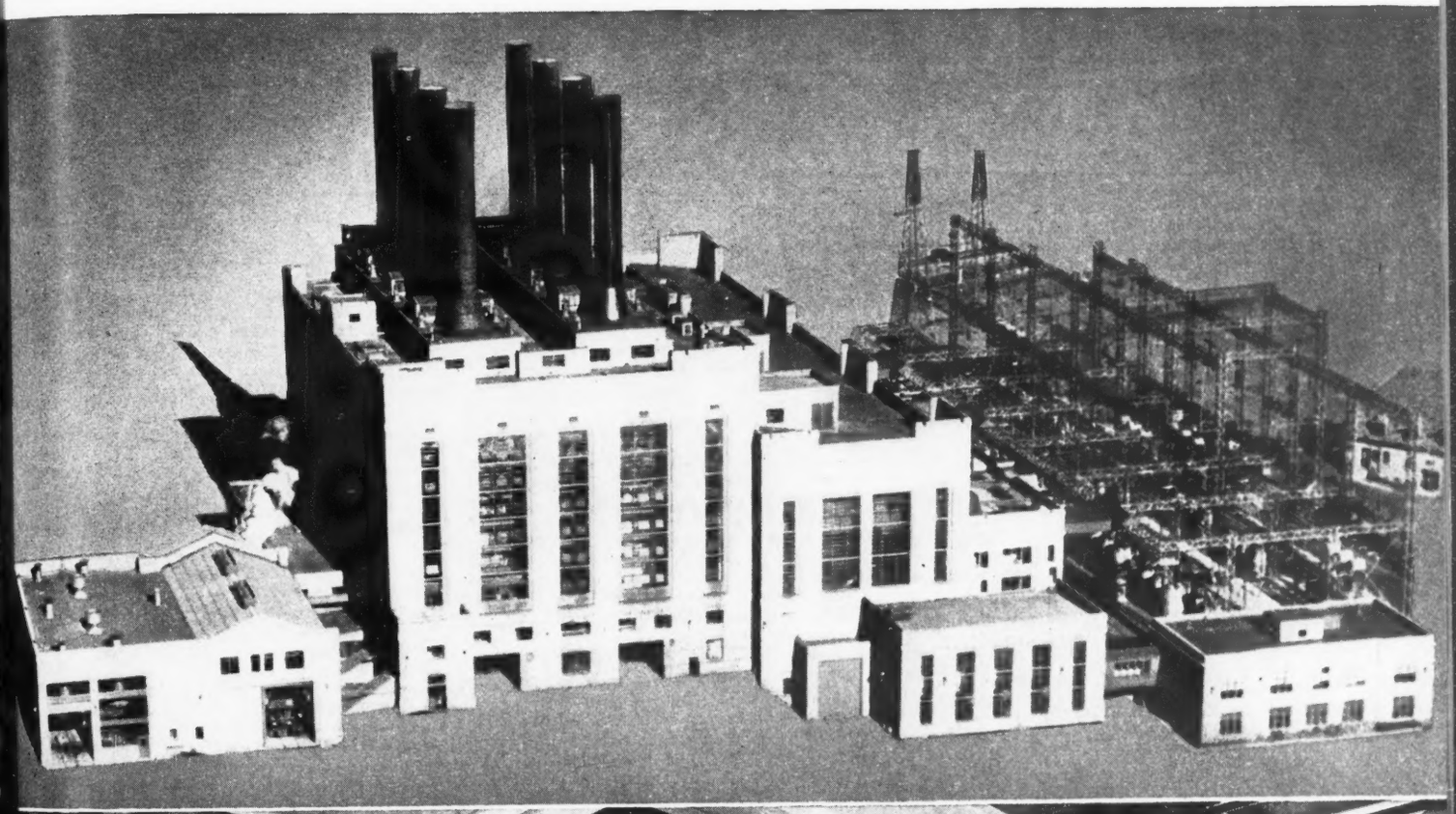

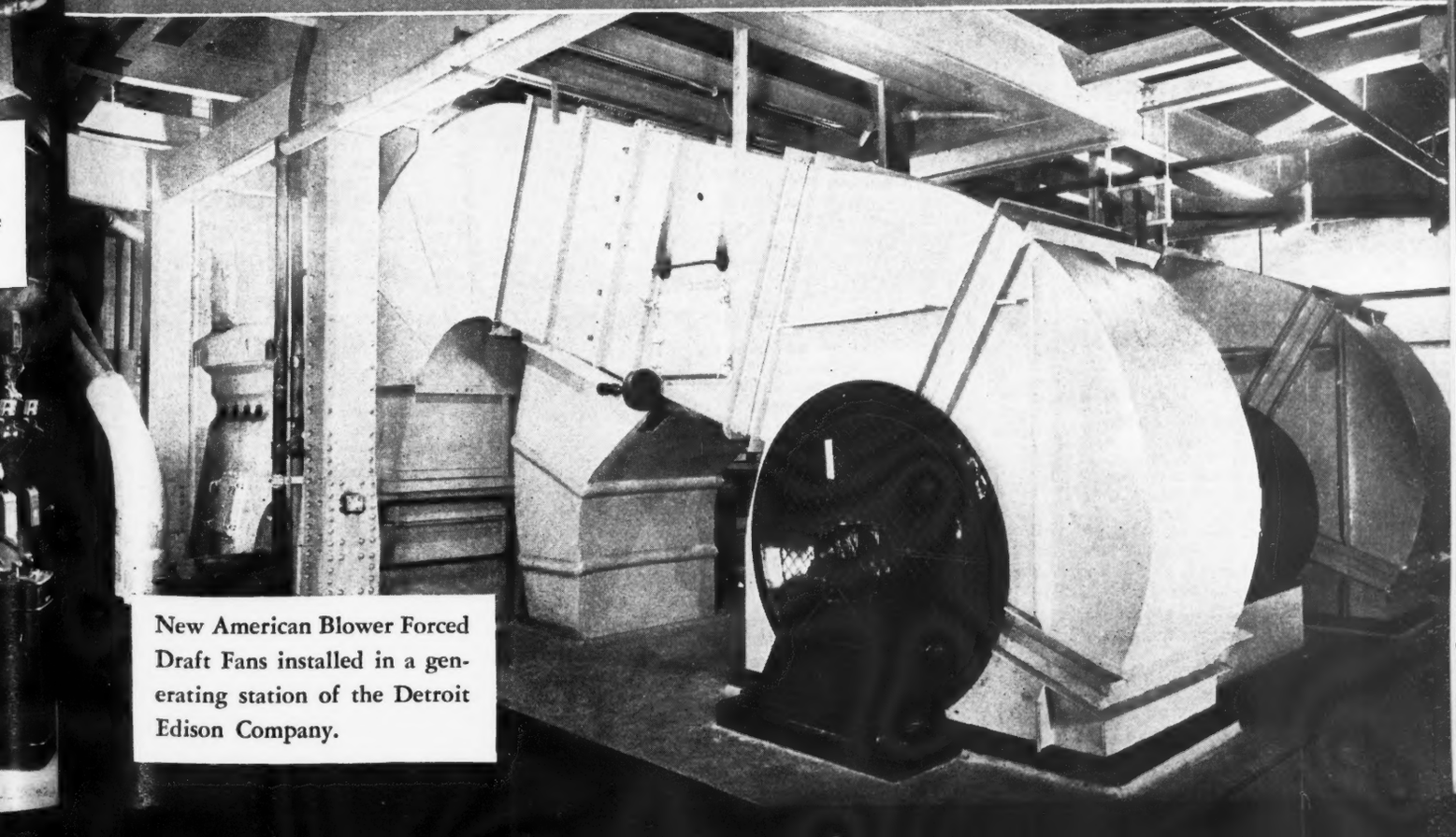

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ADVERTISERS' INDEX

Where an * appears after a name the advertisement does not appear in this issue, but appeared in preceding issues.

Airetool Mfg. Co. ..... *
Air Preheater Corp. 268
Air Reduction 266
Alco Products Division ..... *
Aldrich Pump Co. 251
Allen-Sherman-Hoff Co. ..... *
Allis-Chalmers Mfg. Co. 15, 53
Allpax Co. 182
American Blower Corp. 300–301
American Brass Co. 225
American Chain & Cable Co. 164, 217
American Chimney Co. ..... *
American Coal Burner Co. 298
American District Steam Co. 160
American Engineering Co. 46-47
American Locomotive Co. ..... *
American Metal Hose Branch 225
American Photocopy Equipment Co. 297
American Pulley Co. ..... *
American Pulverizer Co. ..... *
American Radiator & Standard Sanitary Corp. 300–301
Anderson Co., V. D. 34
Armor-Clad Co. 274
Armstrong Machine Works 100-101, 146
Askania Regulator Co. ..... *
Atlas Lumnite Cement 214
Atlas Valve Co. ..... *

Babbitt Steam Specialty Co. 206
Babcock & Wilcox Co. 4-5
Babcock & Wilcox Tube Co. 209
Bacharach Industrial Instrument Co. 297
Bailey Meter Co. 8-9
Baldwin De La Vergne Sales Corp. 131
Baldwin-Hill Co. ..... *
Baldwin Locomotive Works 131
Bartlett & Snow Co., C. O. 199
Bates Co., Walter 224
Beaumont Birch Co. ..... *
Belmont Packing & Rubber Co. 219
Belt Oil & Chemical Co. ..... *
Bethlehem Steel Co. ..... *
Betz, W. H. & L. D. ..... *
Biddle Co., James G. 176
Bird-Archer Co. ..... *
Black, Sivalls & Bryson 245
Blaw-Knox Co. 135
Boiler Tube Co. of America 211
Bonney Forge & Tool Works 150
Borg Warner Corp. 207
Botfield Refractories Co. 202
Bowser & Co., S. F. 297
Brickseal Refractory Co. 222
Bridgeport Brass Co. ..... *
Brownell Co. 298
Brown Instrument Co. 16-17
Brunt Equipment Co. 274
Buell Engineering Co. 234
Buffalo Forge Co. 256
Buffalo Pumps ..... *
Burgess Battery Co. 200
Byers Co., A. M. 62

Canton Stoker Corp. 265
Carborundum Co. ..... *
Cardox Corp. 262
Carey Mfg. Co., Philip 258
Cash Co., A. W. 221
Chapman Valve Mfg. Co. 145
Chicago Metal Hose Corp. 180
Chicago Pneumatic Tool Co. 272e
Chiksan Tool Co. 186
Cities Service Oil Co. ..... *
Clarage Fan Co. 185
Clark Bros. Co. ..... *
Cleaver-Brooks Co. ..... *
Cochrane Corp. 50, 198
Coffin Jr. Co., J. S. 162
Combustion Engineering Co. 36-37
Coppus Engineering Corp. 147
Corning Glass Works ..... *
Crane Co. 141
Crane Packing Co. ..... *
Cryer Trap & Valve Co. 208
Cutler-Hammer, Inc. 123

Dampney Co. of America 163
Darling Valve & Mfg. Co. 151
Dart Mfg. Co., E. M. 144
Davis Regulator Co. 178
Dearborn Chemical Co. ..... *
De Laval Separator Co. ..... *
De Laval Steam Turbine Co. 58, 228
Deming Co. 273
Detroit Stoker Co. 40-41
Diamond Power Specialty Corp. 48-49
Dixon Crucible Co., Joseph ..... *
Dowell Inc. ..... *

Eagle-Picher Lead Co. 52
Edge Moor Iron Works 169
Edward Valve & Mfg. Co. 149
Ehret Magnesia Mfg. Co. 171
Electric Chemical Co. 272
Electric Controller & Mfg. Co. 148
Electric Storage Battery Co. ..... *
Electro Metallurgical Co. ..... *
Elliott Co. 6-7, 187
Engineer Co. 275
Ernst Water Column & Gauge Co. 200
Eureka Packing Co. 190
Everlasting Valve Co. ..... *
Exposition of Power and Mechanical Engineering 15th National 244

Fairbanks Co. 203
Fairbanks Morse & Co. ..... *
Fisher Governor Co. ..... *
Flexrock Co. 208
Flynn & Emrich Co. ..... *
Foote Bros. Gear & Machine Corp. 179
Foster Engineering Co. ..... *
Foster Wheeler Corp. 22-23
Foxboro Co. ..... *
France Packing Co. 194
Frederick Iron & Steel Co. ..... *
Frick Co. ..... *
Fuller Co. 218

Gardner-Denver Co. ..... *
Garlock Packing Co. 26
General Coal Co. ..... *
General Electric Co. 19, 51, 54-55
Gifford-Wood Co. 206
Gilmer Co., L. H. ..... *
Globe Steel Tubes Co. 18
Golden-Anderson Valve Specialty Co. 152
Goodrich Co., B. F. 133
Goodyear Tire & Rubber Co. 27
Goulds Pumps ..... *
Graver Tank & Mfg. Co. ..... *
Greene, Tweed & Co. 196
Green Fire Brick Co., A. P. ..... *
Green Fuel Economizer Co. ..... *
Grinnell Co. ..... Third Cover
Gulf Oil Corp. 165
Gulf Refining Co. 165

Hagan Corp. 32-33
Hall Laboratories 10-11
Haynes Stellite Co. ..... *
Hays Corp. 265
Hays Institute of Combustion 196
Henszey Co. 232
Hercules Float Works 232
Hoffman Specialty Co. ..... *
Homestead Valve Mfg. Co. 250
Honan-Crane Corp. 188
Huyette Co., Paul B. ..... *

Industrial Mineral Wool Institute 275
Infilco Inc. ..... *
Ingersoll Rand Co. 213
International Nickel Co. 56, 167
Iron Fireman Mfg. Co. 159

Jarecki Mfg. Co. 270
Jenkins Bros. 263
Johns Manville 143
Johnson Service Co. 154
Johnston & Jennings Co. ..... *
Jones & Laughlin Steel Corp. 30-31
Jones Foundry & Machine Co., W. A. ..... *

Keasbey & Mattison Co. 157
E. Keeler Co. ..... *
Kellogg Co., M. W. 259
Kennedy Valve Mfg. Co. 246
Kewanee Boiler Corp. 212
Kieley & Mueller 204
Koppers Coal Co. ..... *
Koppers Co. 191

Laminated Shim Co. ..... *
Leavitt Machine Co. 189
Leeds & Northrup Co. ..... Second Cover
Lincoln Electric Co. ..... *
Linde Air Products Co., The 57
Link-Belt Co. 3
Lonergan Co., J. E. 206
Ludlow Valve Mfg. Co. 198
Lummus Co. 261
Lunkenheimer Co. 20-21

Macmillan Petroleum Corp. 248
Magnolia Metal Co. 202
Manhattan Rubber Mfg. Division Raybestos-Manhattan 235
Manzel Brothers Co. ..... *
Marley Co. ..... *
Maxfal Chemical Co. ..... *
Maxim Silencer Co. 188
McGraw-Hill Book Co. 222, 273
Metallizing Co. of America ..... *
Midwest Piping & Supply Co. 267
Minneapolis-Honeywell Regulator Co. 16-17
Monsanto Chemical Co. ..... *
Morse Chain Co. 207
Multiple V-Belt Drive Assn. 197
Murray Iron Works Co. 216

National Aluminate Corp. 129
National Supply Co. ..... *
National Technical Laboratories ..... *
National Tube Co. 136-137
National Valve & Mfg. Co. 243
Nicholson & Co., W. H. 212
Nordberg Mfg. Co. ..... *
Northern Equipment Co. 139
Norton Co. 193
Nugent & Co., W. W. 210

Oakite Products 184
Ohio Injector Co. ..... *
Owens-Illinois Glass Co. 223
Ozalid Products Division 177

Pacific Pump Works....247
Peabody Engineering Corp. .... *
Peerless Pump Division.... *
Permutit Co. ....186, Fourth Cover
Philadelphia Gear Works....201
Pioneer Equipment Corp. of America....274
Pipe Fabrication Institute....264
Pittsburgh Coal Co.... *
Pittsburgh Piping & Equipment Co....253
Pomona Pump Co....231
Porter & Co., H. W.... *
Powell Co., Wm....236-237
Power Piping Division....135
Prat-Daniel Corp. 175
Pritchard & Co., J. F.... *

Raybestos-Manhattan 220
Reading, Pratt & Cady....217
Reeves Pulley Co. .... *
Reliance Electric & Engineering Co....260
Reliance Gauge Column Co....24-25
Republic Flow Meters Co....12-13
Republic Steel Corp. 183
Research Corp. 238
Revere Copper & Brass....272a
Rhoads & Sons, J. E.... *
Rice & Co., Cyrus Wm....44-45
Richardson Scale Co. .... *
Ric-Wil Co. .... *
Riley Stoker Corp. 96-97
Robins Conveying Belt Co.... *
Rockbestos Products Corp....195
Rockwell Co., W. S....208
Roebling's Sons Co., John A....242
Roper Corp., Geo. D....230
Ross Heater & Mfg. Co. .... *
Roto Co. 190
R-S Products Corp. 168

Sarco Co. 173-174
Sauerman Bros. Co....210
Schramm Inc. 158
Scovill Mfg. Co....127
Sea-Ro Packing Co.... *
Shaw Co,, Benjamin F.... 35
Shell Oil Co....254
Simplex Valve & Meter Co.... *
Sinclair Refining Co....161
Skinner Engine Co.... 14
Sloan Valve Co....181
Smith Refractories, Sanford C.... *
Smooth-On Mfg. Co....194
Socony-Vacuum Oil Co.... *
Springfield Boiler Co....249
Square D Co.... *
Squires Co., C. E....270
Standard Chemical Co....204
Standard Oil Co. of California....239
Standard Oil Co. of Indiana....155-156
Standard Pressed Steel Co....204
Star Test Pocket Pliers....274
Staynew Filter Corp.... *
Steel & Tubes Division....183
Stephens-Adamson Mfg. Co....299
Stickle Steam Specialties Co....170
Stock Engineering Co. 232
Strong, Carlisle & Hammond Co....272
Sturtevant Co., B. F.... *
Sturtevant Mill Co. 172
Suhm Co. 228
Sullivan Machinery Co. 28-29
Sun Oil Co. 227
Superior Diesel Engine Div. .... *
Swartwout Co. 304

Taylor & Co., W. A.... *
Taylor Forge & Pipe Works....269
Taylor Instrument Companies....271
Terry Steam Turbine Co. .... *
Texas Co. 42-43
Thermoid Rubber Div. 229
Tide Water Associated Oil Co....240-241
Timken Roller Bearing Co....153
Todd Combustion Equipment .... *
Toledo Pipe Threading Machine Co....270
Tripp Metallic Packing Co. 274
Troy Engine & Machine Co. .... *
Tube-Turns Inc. 215

Union Asbestos & Rubber Co. 252
Union Carbide & Carbon Corp.... 57
Upper Monongahela Valley Coal Ass'n.... *
U. S. Steel Corp. Subsidiaries....136-137, 214

Viking Pump Co. 224
Vogt Machine Co., Henry....255

Walworth Co. 257
Warren Steam Pump Co....226
Water Treatment Co. of America.... *
Watson-Stillman Co. .... *
Webster & Co., Warren.... *
Wedge Protectors Inc. 272
Westinghouse Electric & Mfg. Co....60-61
Weston Electrical Instrument Co.... *
Wheelco Instruments Co. 166
Where To Buy....274
Wickwire Spencer Steel Co.... *
Wilson Inc., Thomas Co. 182
Wing Mfg. Co., L. J.... *
Woodward Governor Co. .... *
Worthington Pump & Machinery Corp....233
Wright Mfg. Division....164

X-Pando Corp. 228
Xzit Sales Co. .... *

Yarnall-Waring Co. 38-39, 125, 184
Youngstown Sheet & Tube Co....192

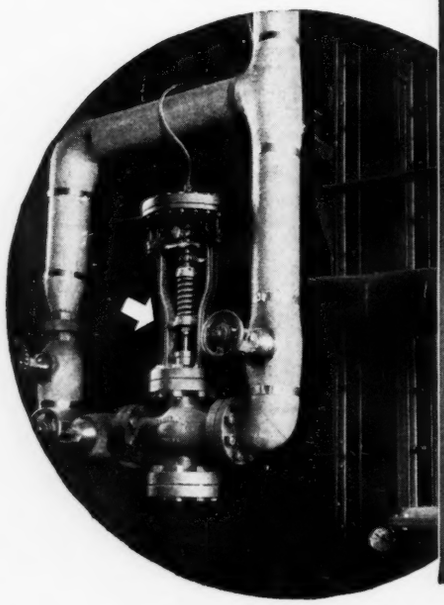
PROFESSIONAL SERVICES—274

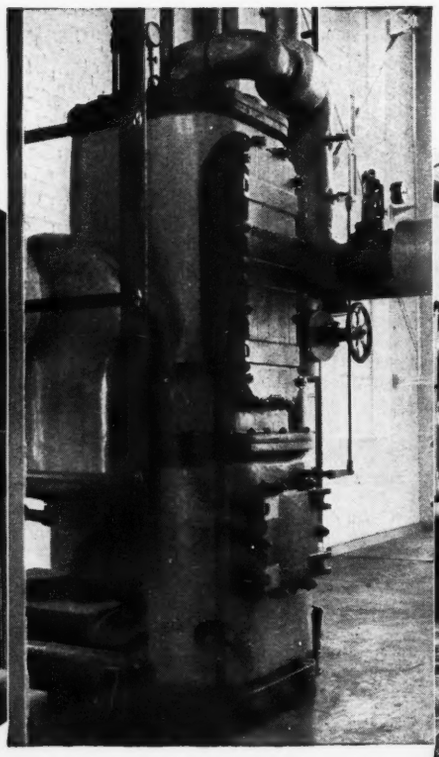
SEARCHLIGHT SECTION

(Classified Advertising)

Classification	Page
BUSINESS OPPORTUNITIES	278
EMPLOYMENT SERVICES	278
POSITIONS VACANT	278
POSITIONS WANTED	278
SELLING OPPORTUNITIES	278
WANTED TO PURCHASE	296
USED & SURPLUS EQUIPMENT	278, 280-296
Acme Equipment Co	296
Aljon Electric Diesel Co	293-296
Arnessen Electric Co	290
Askew, A. C	296
Audel, Theo.	279
Belyea Co., Inc	284
Berger Brothers Electric Motors, Inc	292
Birch Manufacturing Co	293
Brearley, H. P	292
Brew, Woltman & Co., Inc	284
Brill Equipment Corp	293
Chicago Electric Co	286
Cooks Falls Electric Co., Inc	278
Crawbuck Co., John D	291
Davis, J. F	294
Dayton Steel & Mchy. Co	294
Denny & Clark	292
Diesel Installation Corp. of Amer	296
Douglass Co., Stephen A	292-294
Duquesne Electric & Mfg. Co	291
Eaton Co. Ltd., T	294
Ebasco Services, Inc	294
Edwards & Son, E. W	278
Electric Apparatus Repair Co	292
Electric Equipment Co.	294-296
Electric Motor & Repair Co	295
Electric Service Co., Inc	296
Ellis Co., A. Lee	290
Empire Used Boiler Supply Co	292
Erie Electric Co., Inc	288
Fletcher Sales Co	294
Glow Electric Co	295
H & P Machinery Co	292
Hall & Co., Stephen	293
Hemphill & Co., Inc., J. L	282
Hitchcock Gas Engine Co	294
Howe Bros.	295
Hudson Coal Co	293
International Chimney Corp	296
Iron & Steel Products, Inc	293-295-296
Jackson-Bayley Electric Co	294
Kiemle Co., Fred W	292
Kirk Co., Wallace C	291
Land & Co., L. J	289
Material Acquisition Engr.	295
Metropolitan Plumbing Supply Co., Inc.	292-295
Mettler, A. T	296
Mississippi Valley Equipment Co	293
Moorhead-Reitmeyer Co., Inc	292
National Power Machinery Co	280-281
Nimmo Electric Co., A. H	296
O'Brien Mchy. Co	288
Pacific Machinery Co	294
Philadelphia Transformer Co., Inc	292
Polar Ice & Fuel Co	296
Power Plant Equipment Co., Inc	286
Price & Co	278
Quick Service Laundry #1 Inc	296
Rearick, Charles B	295
Ross Power Eq. Co	294
Sachsenmeier Co., Geo	290
Sandman El. Motor Co	291
1695 Elmwood Ave., Corp	294
Stanhope, Russell	296
Stewart & Co., Inc., Paul	285
Sullivan Co., Joe	290
Sullivan, W. L	296
Tidewater Equipment & Machy. Corp	296
Treyz, Geo. I., Estate of	278
Utilities Electrical Mchy. Corp	287
Vande Water Co	294
Wagner Co., Arthur	295
Wente Electric Co	289
Werby & Co., Milton	290
Wieda, Elmer G	278
Wilms, Weaver & Co	283
Woodworth Engr. Co., H. A	290

● The Swartwout Feed Water Regulating Valve which connects to "generator" at the boiler drum by only one small flexible tube.





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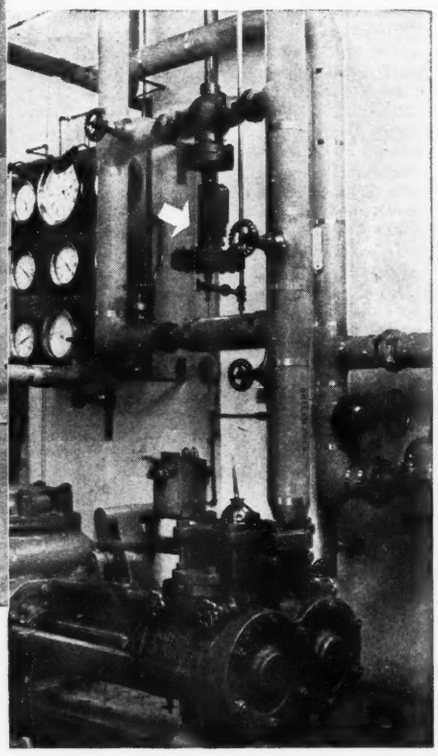
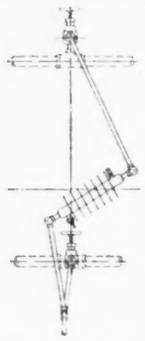
● Swartwout Differential Type A Pump Governor regulates B. F. pumps.



"ALL-SWARTWOUT" control of your feed water is wise insurance against costly power failure



A simple hook-up of the generator which actuates the regulator shown above. This self-contained unit is located on the water column piping

YOU have too much at stake in the safe operation of your power plant to risk anything but fully coordinated, dependable feed water controls. Swartwout Equipment has a reputation for outstanding performance — unified control that serves you year after year with unfailing regulation. • That reputation led to the installation of an "All-Swartwout" control of feed water in the U. S. Veterans' Hospital at Brecksville, Ohio. The Heater, tailored to the individual requirements, has been tested and its performance on the oxygen removal guarantee certified. The powerful though simple thermo-hydraulic Feed Water Regulator supplies sensitive direction of water supply and the Swartwout Pump Governor regulates the speed of the B. F. pumps. • With a 36-year background of building high quality power plant equipment, Swartwout guarantees completely satisfactory performance of feed water units, pressure controls, desuperheaters and related equipment. Proposals gladly submitted after discussion of your problems. Ask for descriptive bulletins!

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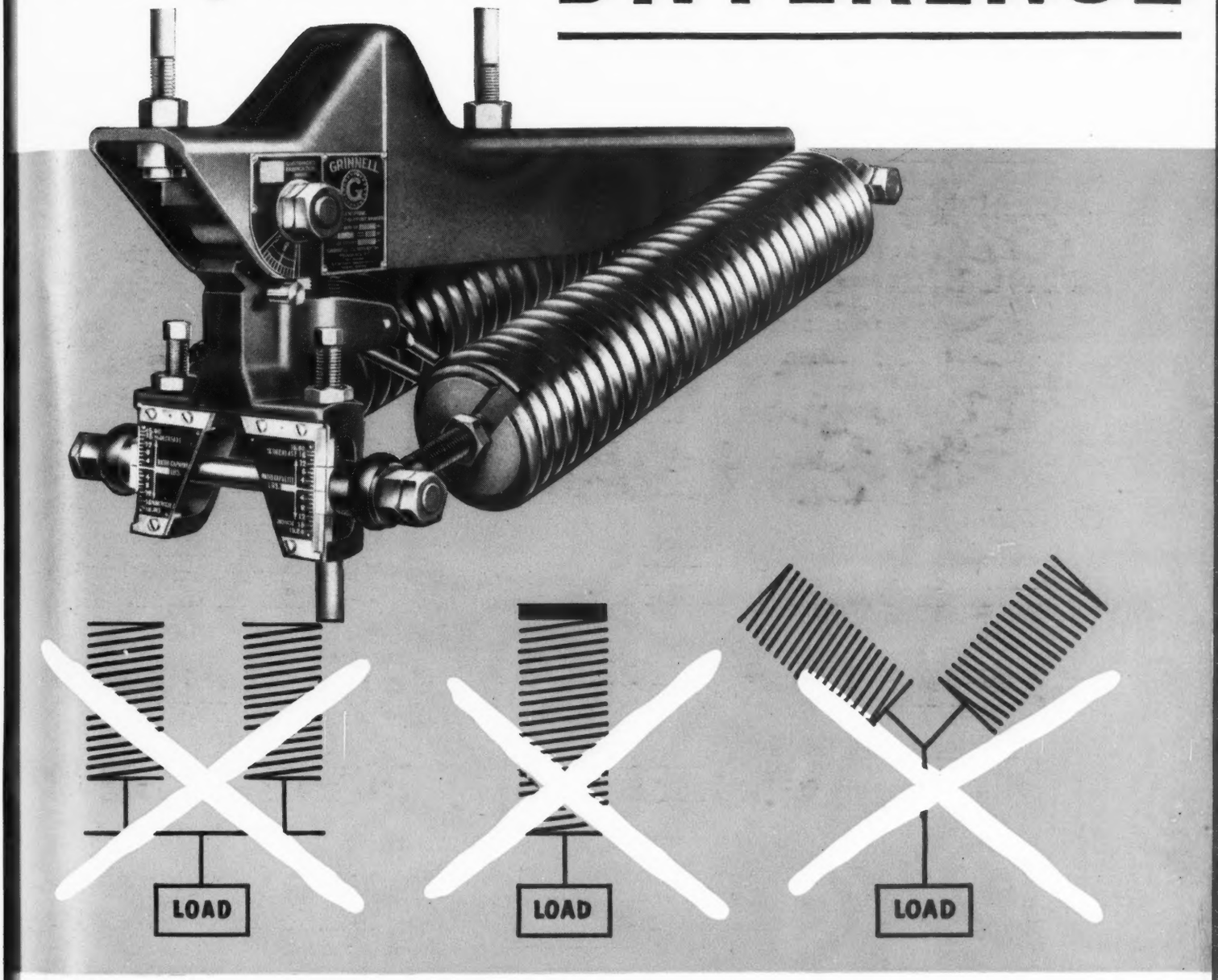

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